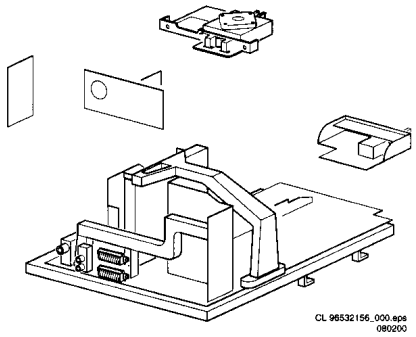
PHILIPS 29PT8006

MODEL

SERVICE MANUAL

EM2E
AA

Service
Service
Service



Service Manual

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PHILIPS

1. Technical specifications, connection facilities and chassis overview

1.1 Technical specifications

1.1.1 Reception

Tuning system	:	PLL
Reception	:	
TV systems off air	:	PAL B/G/I, SECAM B/G/L/L' for Western Europe
	:	PAL B/G, SECAM B/G/D/K, NTSC M for Eastern Europe
Sound systems	:	FM
	:	AM
	:	NICAM B/G/D/K/I
A/V connections	:	PAL B/G/D/K/I
	:	SECAM B/G/D/K/L/L'
	:	NTSC video playback
Channel selections	:	100 channels: VHF, UHF, S-Channels, Hyperband
Frequency range	:	44.25 - 855.25 MHz
Aerial input	:	Coaxial 75Ω
VCR preselections	:	0 and 90 - 99

1.1.2 Miscellaneous

Mains voltage	:	220V - 240V (± 10 %); 50 - 60Hz (± 5 %)
Ambient temperature	:	+5 to +45 deg. Celcius
Standby Power Consumption	:	< 1W

1.2 Connection facilities

1.2.1 Side I/O connections

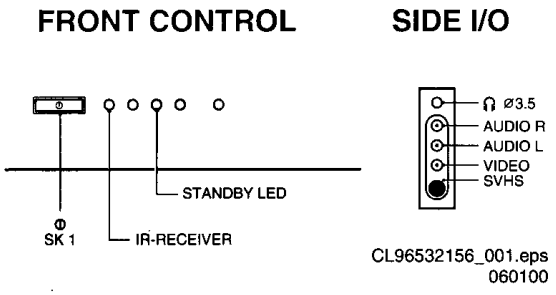

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Figure 1-1

Audio / video

- - Video (CVBS)	$1V_{PP}$ / 75Ω	
- - Audio	L ($0.5V_{RMS}$ / 10kΩ)	
- - Audio	R ($0.5V_{RMS}$ / 10kΩ)	
- - Headphone	(32 - 2000Ω / 10mW)	

SVHS

1 -	GND	
2 -	GND	
3 - Y	($1V_{PP}$ / 75Ω)	
4 - C	($0.3V_{PP}$ / 75Ω)	

1.2.2 Rear connections

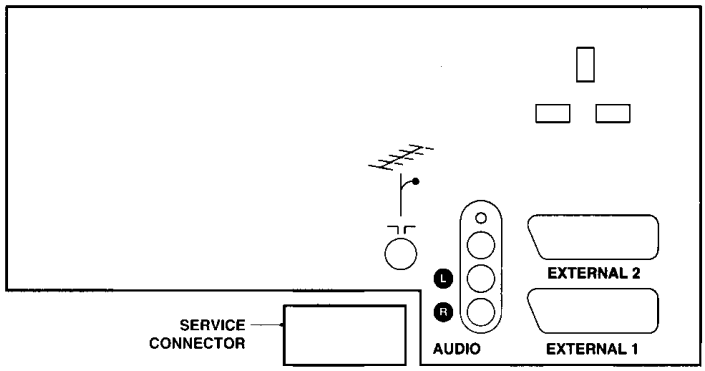

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Figure 1-2

Audio

- - Audio	L ($0.5V_{RMS}$ / 10kΩ)	
- - Audio	R ($0.5V_{RMS}$ / 10kΩ)	

External 1 (in/out): RGB+CVBS

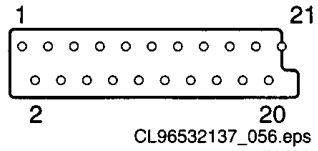

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Figure 1-3

1 - Audio	R ($0.5V_{RMS}$ / 1kΩ)	
2 - Audio	R ($0.5V_{RMS}$ / 10kΩ)	
3 - Audio	L ($0.5V_{RMS}$ / 1kΩ)	
4 - Audio	GND	
5 - Blue	GND	
6 - Audio	L ($0.5V_{RMS}$ / 10kΩ)	
7 - Blue	($0.7V_{PP}$ / 75Ω)	
8 - CVBS-status	0 - 1.3V: INT, 4.5 - 7V: EXT 16:9, 9.5 - 12V: EXT 4:3	
9 - Green	GND	
10-		
11- Green	($0.7V_{PP}$ / 75Ω)	
12-		
13- Red	GND	
14- RGB-status	GND	
15- Red	($0.7V_{PP}$ / 75Ω)	
16- RGB-status	0 - 0.4V: INT 1 - 3V: EXT / 75Ω	
17- CVBS	GND	
18- CVBS	GND	
19- CVBS	($1V_{PP}$ / 75Ω)	
20- CVBS	($1V_{PP}$ / 75Ω)	
21- Earth	GND	

External 2 (in/out): SVHS+CVBS (intended for VCR)

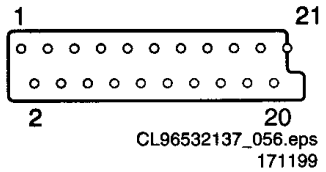

Figure 1-4

1 - Audio	R ($0.5V_{RMS}$ / 1kΩ)	⊖→
2 - Audio	R ($0.5V_{RMS}$ / 10kΩ)	⊖
3 - Audio	L ($0.5V_{RMS}$ / 1kΩ)	⊖→
4 - Audio	GND	⏚
5 -	GND	⏚
6 - Audio	L ($0.5V_{RMS}$ / 10kΩ)	⊖
7 -		
8 - CVBS-status	0 - 1.3V: INT, 4.5 - 7V: EXT 16:9, 9.5 - 12V: EXT 4:3	
9 -	GND	⏚
10-	Easy link	
11-		
12-		
13- Red	GND	⏚
14- RGB-status	GND	⏚
15- C	($0.7V_{PP}$ / 75Ω)	⊖
16-		
17- CVBS	GND	⏚
18- CVBS	GND	⏚
19- CVBS	($1V_{PP}$ / 75Ω)	⊖→
20- Y/CVBS	($1V_{PP}$ / 75Ω)	⊖
21- Earth	GND	⏚

1.3 Chassis overview

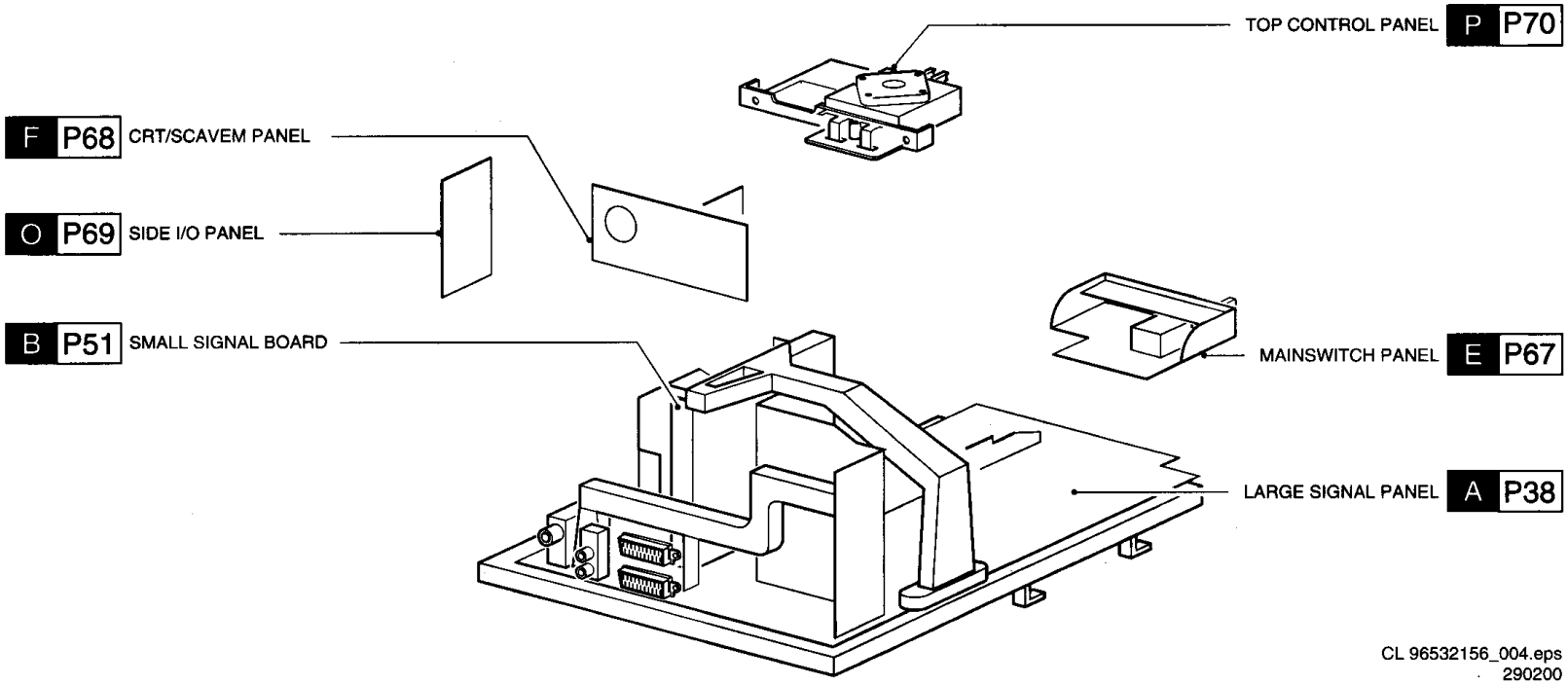

Figure 1-5

2. Safety & Maintenance instructions, Warnings and Notes

2.1 Safety instructions for repairs

Safety regulations require that during a repair:

- Due to the EM2E concept, a very large part of this chassis (incl. Hor. & Vert. deflection) is 'hot'. Therefore the set must be connected to the mains via an isolating transformer.
- Safety components, indicated by the symbol ⚠, should be replaced by components identical to the original ones.
- When replacing the CRT, safety goggles must be worn.

Safety regulations require that after a repair, the set must be returned in its original condition. In particular attention should be paid to the following points:

- General repair instruction: as a strict precaution, we advise you to resolder the solder joints, through which the horizontal deflection current is flowing, in particular:
  - All pins of the line output transformer (LOT);
  - Fly-back capacitor(s);
  - S-correction capacitor(s);
  - Line output transistor;
  - Pins of the connector with wires to the deflection coil;
  - Other components through which the deflection current flows.

Note: This resoldering is advised to prevent bad connections due to metal fatigue in solder joints and is therefore only necessary for television sets older than 2 years.

- The wire trees and EHT cable should be routed correctly and fixed with the mounted cable clamps.
- The insulation of the mains lead should be checked for external damage.
- The mains lead strain relief should be checked for its function in order to avoid touching the CRT, hot components or heat sinks.
- The electrical DC resistance between the mains plug and the secondary side should be checked (only for sets which have a mains isolated power supply). This check can be done as follows:
  - Unplug the mains cord and connect a wire between the two pins of the mains plug;
  - Set the mains switch to the 'ON' position (keep the mains cord unplugged!);
  - Measure the resistance value between the pins of the mains plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 MΩ and 12 MΩ.
  - Switch off the TV and remove the wire between the two pins of the mains plug.
- The cabinet should be checked for defects to avoid touching of any inner parts by the customer.

2.2 Maintenance instructions

It is recommended to have a maintenance inspection carried out by a qualified service employee. The interval depends on the usage conditions:

- When the set is used under normal circumstances, for example in a living room, the recommended interval is 3 to 5 years.
- When the set is used in circumstances with higher dust, grease or moisture levels, for example in a kitchen, the recommended interval is 1 year.
- The maintenance inspection contains the following actions:
  - Execute the above-mentioned 'general repair instruction'.
  - Clean the power supply and deflection circuitry on the chassis.
  - Clean the picture tube panel and the neck of the picture tube.

2.3 Warnings

- In order to prevent damage to IC's and transistors, all high-voltage flashovers must be avoided. In order to prevent damage to the picture tube, the method shown in Fig. 2-1 should be used to discharge the picture tube. Use a high-voltage probe and a multimeter (position VDC). Discharge until the meter reading is 0 V (after approx. 30 s).
- ⚠ All IC's and many other semiconductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. When repairing, make sure that you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.
- Together with the deflection unit and any multipole unit, the used flat square picture tubes form an integrated unit. The deflection and the multipole units are set optimally at the factory. Adjustment of this unit during repair is therefore not recommended.
- Be careful during measurements in the high-voltage section and on the picture tube.
- Never replace modules or other components while the unit is switched ON.
- When making settings, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.
- Wear safety goggles during replacement of the picture tube.

2.4 Notes

- The direct voltages and oscillograms should be measured with regard to the tuner earth (⏚) or hot earth (⏚).
- The direct voltages and oscillograms shown in the diagrams are indicative and should be measured in the Service Default Mode (see chapter 5) with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz.
- Where necessary, the oscillograms and direct voltages are measured with (⊓) and without (⊼) aerial signal. Voltages in the power supply section are measured both for normal operation (⏻) and in Standby (⏻). These values are indicated by means of the appropriate symbols.
- The picture tube PWB has printed spark gaps. Each spark gap is connected between an electrode of the picture tube and the Aquadag coating.
- The semiconductors indicated in the circuit diagram and in the parts lists are completely interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.
- Manufactured under license from Dolby Laboratories Licensing Corporation. DOLBY, the double D symbol and PRO LOGIC are trademarks of Dolby Laboratories Licensing Corporation.

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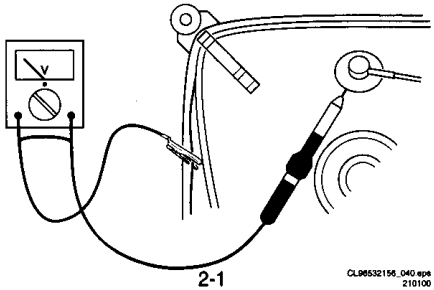

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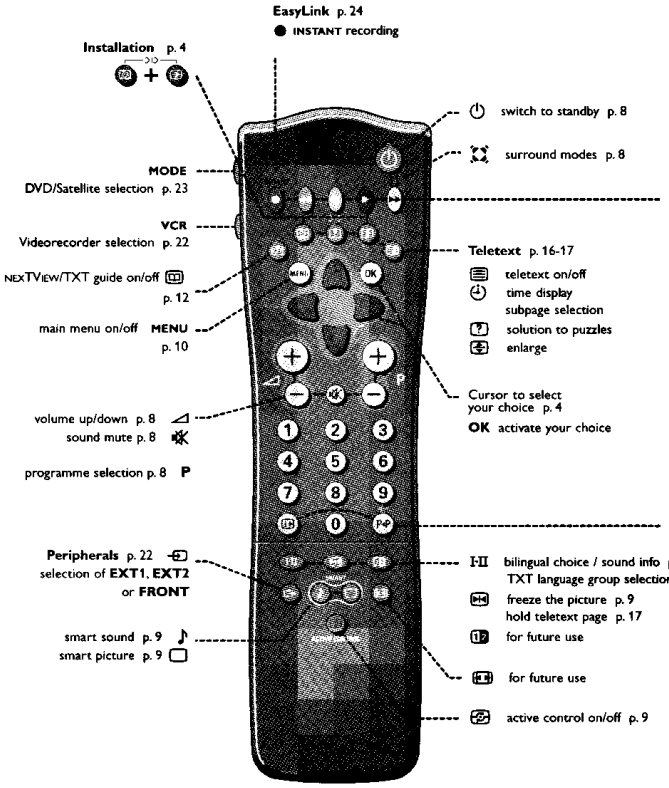
EasyLink features are based on the "one touch operation" approach. This means that a sequence of actions are executed at the same time in both the television and the video cassette recorder, ***provided both are fitted with the EasyLink function*** *and connected with the eurocable supplied with your video recorder.*

English

Preparation

Your remote control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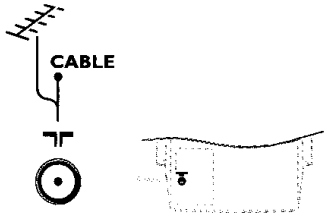
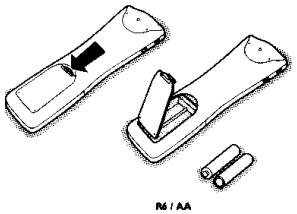
Preparation

1. **Place the TV on a solid surface.**
   For ventilation, leave at least 5 cm free all around the TV.
   Do not place the TV on a carpet.
   To prevent any unsafe situations, do not place any objects on top of the TV.
   Avoid heat, direct sunlight and exposure to rain or water.

2. **Insert the aerial plug** firmly into the aerial socket at the back of the TV.



3. Insert the mains plug in the wall socket having a mains voltage of 220V-240V.
   To prevent damaging the mains (AC) cord which could cause a fire or electric shock, do not place the TV on the cord.



4. Remote control: Remove the cover of the battery compartment.
   Insert the 2 batteries supplied (Type R6-1.5V).

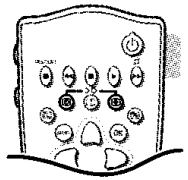
   The batteries supplied do not contain the heavy metals mercury and cadmium. Nevertheless in many countries exhausted batteries may not be disposed of with your household waste. Please check on how to dispose of exhausted batteries according to local regulations.

   Note: this remote control functions with TVs which use the RC6 signalling standard.

5. **Switch the TV on :** Press the power switch ⏻ on the front of your TV.
   A red indicator on the front of the TV lights up and the screen comes on.
   If the TV is in standby mode (see p. 8), press the **- P+** key on the remote control.
   When you switch on your set ***for the first time****, the menu* **LANGUAGE** *automatically appears on the screen. The explanation appears in different languages one at a time. Choose your own language and press the* **OK** *key on the remote control.*

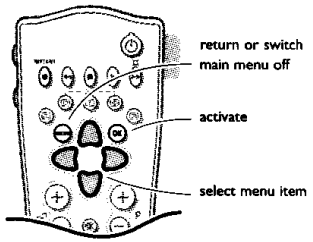
Go on to page 4, Store TV channels.

Installation



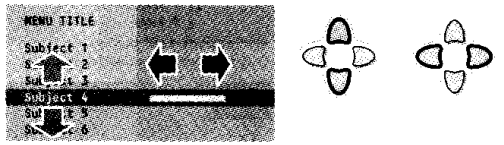
Select the INSTALLATION menu

Press ⏻ and ⊕ at the same time.



To use the menus

1. Use the cursor in the up/down, left/right directions to select a menu item.
2. Press the **OK** key to activate.
3. Use the **MENU** key to return or to switch the menu off.

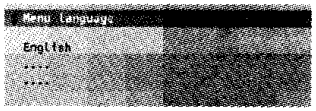


Store TV channels

easy LINK

After the new or extra TV channels have been stored, the TV automatically transfers those TV channels to the video recorder if it is equipped with the EasyLink function. The message ***EasyLink : downloading .....*** *appears on the screen. The programme list of the video recorder is now the same as the one of the TV. If the TV is connected to a video recorder which supports the* NEXTVIEWLINK *function, the TV also automatically transfers the language and country selections to the video recorder.*

Select the menu language and country

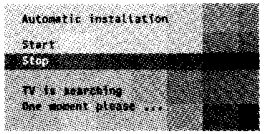


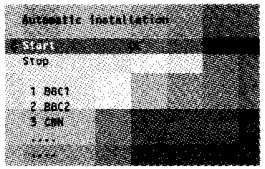
First, select your language and country.

1. Select **Menu language** and press the **OK** key.
2. Select your language and press the **OK** key.
   Use the cursor up/down to scroll through the list and to bring up other languages which are not displayed on the screen at present.
3. Select **Country** and press the **OK** key.
4. Select the country where you are now located and press the **OK** key.
   Use the cursor up/down to scroll through the list and bring up other countries which are not displayed on the screen at present.

   Select **Other** when none of the countries applies.

   You can now search for and store the TV channels in two different ways: using **automatic installation** or **manual installation** (tuning-in channel by channel).
   Select your choice and press the **OK** key.





Automatic installation

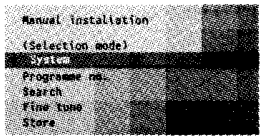
In the Automatic installation menu select **Start** and press the **OK** key to activate the searching. All TV channels are searched for and stored automatically.

If a cable system which broadcasts ACI (Automatic Channel Installation) or a TV channel transmitting a teletext page with the frequencies and programme names of all the TV channels which can be received, is detected, the search is stopped and a programme list appears.
The programme list is automatically filled with all the programme numbers and names of the TV channels transmitted.

It is possible that the cable company or the TV channel displays a broadcast selection menu. Layout and items are defined by the cable company or the TV channel. Make your choice with the cursor and press the **OK** *key.*

To exit from the menu press the **MENU** key on the remote control.

Go on to page 6.



Manual installation

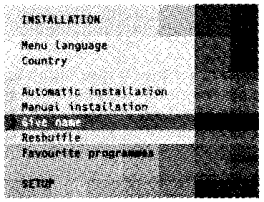
Searching for and storing TV channels is done channel by channel.
You must go through every step of the Manual installation menu.

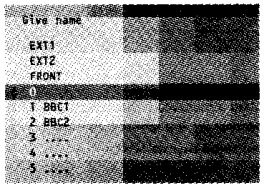
Selection mode is only present and lights up if the country selected also offers the channel option (C-channels for aerial channels, S-channels for cable channels).
You can choose either channel or frequency mode.

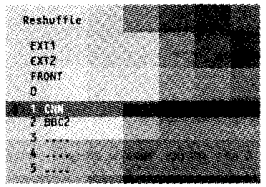
1. Select the TV system
   Select the country or part of the world from where you want to receive the TV channel.
   If you are connected to a cable system, select your country or part of the world where you are now located.
2. Press the cursor down and enter the programme number with the digit keys.
3. Search for a TV channel
   Press the cursor left/right.
   The frequency or the channel number increases until a TV channel is found.

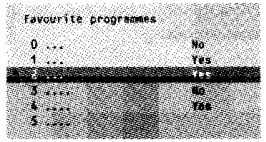
   Direct selection of a TV channel
   If you know the frequency, the C- or S-channel number, enter it directly with the digit keys 0 to 9.
   Ask for a list from your cable company or dealer, alternatively consult the Table of frequencies on the inside backcover of this handbook.
4. Fine tune
   In case of poor reception, you can improve the reception by adjusting the frequency with the cursor left/right.
5. To store your TV channel, select **Store** and press the **OK** key.

   Repeat steps 1 to 5 to store another TV channel.
6. To exit from the menu press the **MENU** key on the remote control.









Give name

It is possible to change the name stored in the memory or to assign a name to a TV channel which has not yet been entered. A name with up to 5 letters or numbers can be given to the programme numbers 0 to 99. For example SUPER, BBC1,... Between 99 and 0 you can also name any peripherals that are connected to a euroconnector.

1. Select **Give name** in the **INSTALLATION** menu and press the **OK** key.
2. Select the programme number.
3. Press the **OK** key.
4. Select the character with the cursor up/down.
5. Select the following position with the cursor right.
6. Select the following character.
7. Press the **OK** key when finished.
8. Press the **MENU** key to return to the **INSTALLATION** menu.

Space, numbers and other special characters are located between Z and A.

Reshuffle the programme list

According to your preference you **can** change the order of the stored TV channels.

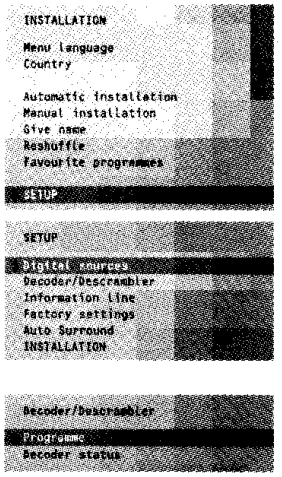
1. Select **Reshuffle** in the **INSTALLATION** menu and press the **OK** key.
2. Select the programme number you want to exchange.
3. Press the **OK** key.
4. Select the new number you want to exchange it with.
5. Press the **OK** key.
   Repeat the operation until all TV channels are allocated as you like.
6. Press the **MENU** key to return to the **INSTALLATION** menu.

Select Favourite TV channels

After leaving the installation you can browse through the TV channels by pressing the **- P +** key. Only those TV channels which are in the favourite list will be displayed. Non-favourite TV channels can still be selected with the digit keys. By default all stored channels are added to the favourite list.

1. Select **Favourite programmes** in the **INSTALLATION** menu and press the **OK** key.
2. Select your favourite programme number.
3. Select **Yes** or **No** with the cursor left/right.
4. Repeat for every TV channel you want to make a favourite or a non-favourite TV channel.
5. Press the **MENU** key to return to the **INSTALLATION** menu.

In order for NEXTVIEW to function properly, the first TV channel from the favourite list should also broadcast the correct local date and time via teletext.



Install TV Setup

The Setup menu allows you to adjust initial settings, i.e. those which are not related to the installation of the TV channels.
The Setup menu contains items that control the settings of the TV's functions, features, services and peripherals you may have connected.

1. Use the cursor in the up/down, left/right directions to select the menu item.
2. Use the **OK** key to activate.
3. Use the **MENU** key to return or switch menu off.

Digital sources
See Connect Peripheral Equipment, p. 20 to connect your digital equipment, like a DVD, a digital satellite tuner or a similar digital device.

Define Decoder/Descrambler programme numbers
If a decoder or a descrambler is connected, see p. 19 you can define one or more programme numbers as decoder programme numbers.

Press the cursor left/right to select the input used to connect to your decoder **Off**, **EXT1** or **EXT2**.
Select **Off** if you do not want the selected programme number being activated as a decoder programme number.

easyLINK

Select **EXT2** *when the decoder is connected to your EasyLink video recorder. When selecting the decoder, the message* ***EasyLink: downloading presets....*** *appears on the screen.*

Information line
Select **On** and after the selection of a TV programme or after pressing the i+ key on the remote control, a TV channel which broadcasts teletext may transmit the name of the TV channel, the programme name or another message. This is displayed on screen next to information about sound.
When selected **Off**, only sound information is displayed after the selection of a TV channel or after pressing the i+ key.

Factory settings
Select **Factory settings** and press the **OK** key to restore picture and sound settings, predefined in the factory.

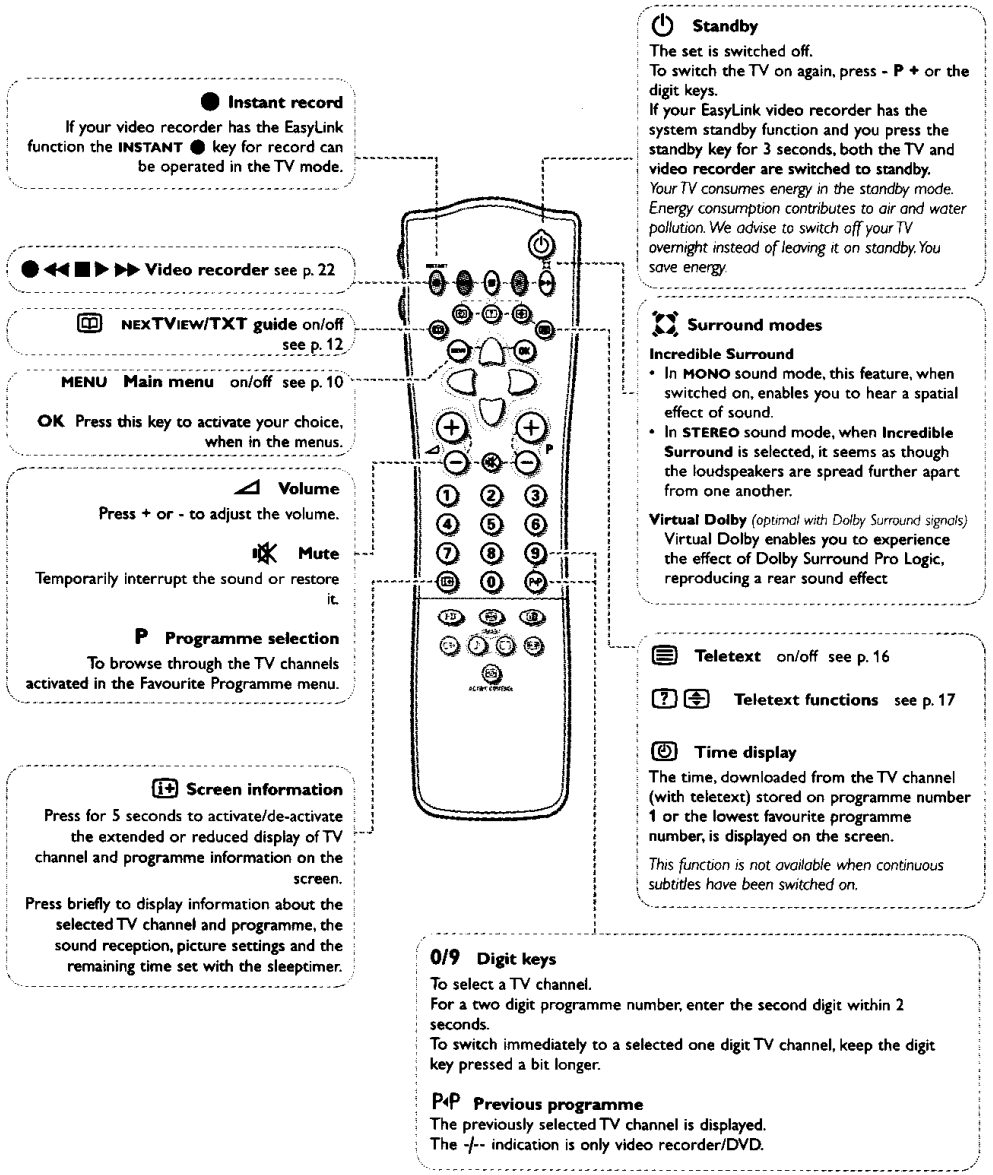
Auto Surround
Sometimes the broadcaster transmits special signals for Surround Sound encoded programmes. In that case, the TV automatically switches to the best Surround Sound mode when Auto Surround is switched on. Virtual Dolby will be reproduced, see p. 8.
Overruling this surround mode remains possible.

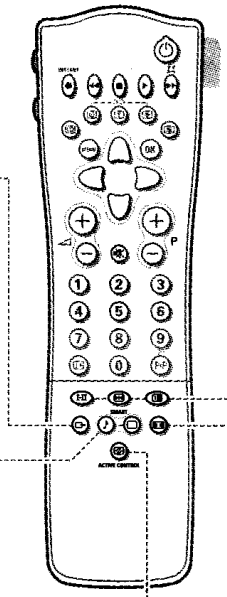
Installation
Select **Installation** and press the **OK** key to return immediately to the **INSTALLATION** menu.

4. To exit from the menu press the **MENU** key repeatedly.

Operation

Use of the remote control


● Instant record
If your video recorder has the EasyLink function the INSTANT ● key for record can be operated in the TV mode.
● ◀◀ ■ ▶ ▶▶ Video recorder see p. 22
NEXTVIEW/TXT guide on/off see p. 12
MENU Main menu on/off see p. 10
OK Press this key to activate your choice, when in the menus.
Volume
Press + or - to adjust the volume.
Mute
Temporarily interrupt the sound or restore it.
P Programme selection
To browse through the TV channels activated in the Favourite Programme menu.
i+ Screen information
Press for 5 seconds to activate/de-activate the extended or reduced display of TV channel and programme information on the screen.
Press briefly to display information about the selected TV channel and programme, the sound reception, picture settings and the remaining time set with the sleeptimer.
Standby
The set is switched off.
To switch the TV on again, press - P + or the digit keys.
If your EasyLink video recorder has the system standby function and you press the standby key for 3 seconds, both the TV and video recorder are switched to standby.
Your TV consumes energy in the standby mode. Energy consumption contributes to air and water pollution. We advise to switch off your TV overnight instead of leaving it on standby. You save energy.
Surround modes
Incredible Surround
• In MONO sound mode, this feature, when switched on, enables you to hear a spatial effect of sound.
• In STEREO sound mode, when Incredible Surround is selected, it seems as though the loudspeakers are spread further apart from one another.
Virtual Dolby (optimal with Dolby Surround signals)
Virtual Dolby enables you to experience the effect of Dolby Surround Pro Logic, reproducing a rear sound effect
Teletext on/off see p. 16
Teletext functions see p. 17
Time display
The time, downloaded from the TV channel (with teletext) stored on programme number 1 or the lowest favourite programme number, is displayed on the screen.
This function is not available when continuous subtitles have been switched on.
0/9 Digit keys
To select a TV channel.
For a two digit programme number, enter the second digit within 2 seconds.
To switch immediately to a selected one digit TV channel, keep the digit key pressed a bit longer.
P◁P Previous programme
The previously selected TV channel is displayed.
The -/-- indication is only video recorder/DVD.



Select peripherals
Press this key repeatedly to select **EXT1**, **EXT2** or **FRONT**, according to where you connected the peripherals (p. 22).

Smart Keys
To select predefined picture and sound settings.

Smart Sound
Each time it is pressed, a different sound setting is selected, corresponding with specific factory setting of the equalizer.

Smart Picture
Each time it is pressed, a different picture setting is selected, corresponding with specific factory settings of Contrast, Colour, Sharpness and Dynamic Contrast.

Personal refers to the personal preference settings of picture and sound selected in the picture and sound menu.
Remark: the moment you are in a predefined smart sound or picture setting and you modify a setting in the picture or sound menu, all values of the menu will overwrite the previously made settings.

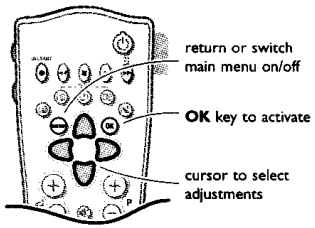
I-II Bilingual choice and sound mode selection
Press this key
- to switch from **Stereo** to **Mono** sound, in case of stereo transmission, or from **Nicam Stereo** to **Nicam available**, in case of digital transmission;
- to choose between language I (Dual I) or language II (Dual II), in case of bilingual transmission. The setting is separately stored for each TV channel.

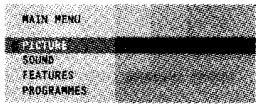
Freeze
To activate/de-activate the frozen picture or to hold a teletext page.

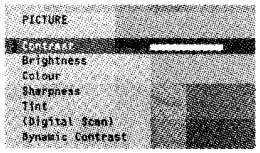
for future use

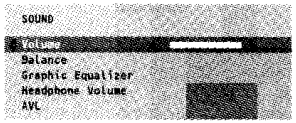
for future use

Active control
Active control is a pro-active and automatic system. The TV continuously measures and corrects all incoming signals in order to provide the best picture possible.
Press the key to select the Active Control values Off or On.
Off Sharpness and Dynamic Contrast are controlled automatically
On Sharpness, Dynamic Contrast and Noise Reduction are controlled automatically.
Press the cursor in the up/down directions while the selected Active Control setting information is on top of the screen.
The Active Control menu appears.
The picture settings are being adapted continuously and automatically.
The menu items cannot be selected.
Press the cursor in the up/down directions again to switch off the menu.









Use of the menus

1. Press the **MENU** key to display/cancel the **MAIN MENU**.
2. Use the cursor in the up/down directions to select the **PICTURE, SOUND** or **FEATURES** menu or to select the **PROGRAMMES**.
3. Press the cursor right to activate the selected menu.
4. Use the cursor in the up/down, left/right directions to select the menu item.
5. Use the **OK** key to activate.
6. Press the **MENU** key repeatedly to return or to switch the menu off.

Picture menu

If an NTSC peripheral is connected to one of the euroconnectors, the option Hue also appears.

Tint
Select the colour temperature: **Normal, Warm** or **Cool**.

Digital Scan (Line Flicker Reduction) *(if provided)*
In certain circumstances while watching TV programmes it may be preferable to switch off the digital scan line flicker reduction.
Press the cursor left/right to select **On** of **Off**.

Dynamic Contrast
To make the contrast in the darker and the brighter picture areas more noticeable, select the **Med** setting.
In certain circumstances it may be preferred to select **Min, Max** or **Off**.

The modified adjustments for Contrast, Brightness, Colour, Sharpness, Tint, (Digital Scan) and Dynamic Contrast are automatically stored for all TV channels.
Select **Factory settings** in the Setup menu to restore the predefined factory settings, see p. 7.

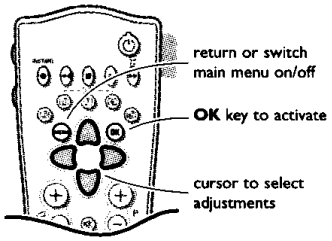
Sound menu

The modified adjustments for Volume, Balance, Treble and Bass are automatically stored for all TV channels.
Select **Factory settings** in the Setup menu to restore the predefined factory settings, see p. 7.

Graphic Equalizer
Here you can select the preferred sound setting which corresponds with the personal sound settings.

Headphone volume
See Connect Peripheral Equipment, p. 21, for the connection of the headphone.

AVL (Automatic Volume Leveller)
AVL automatically controls the volume level to avoid too large level differences, especially when switching to another programme or during commercial breaks.



Features menu

1. Press the **MENU** key to display/cancel the **MAIN MENU**.
2. Use the cursor in the up/down directions to select the **FEATURES** menu.
3. Press the cursor right to activate the selected menu.
4. Use the cursor in the up/down directions to select a menu item.
5. Use the cursor in the left/right directions to select the desired setting.

Sleeptimer

With the sleeptimer you can set a time period after which the TV should switch itself to standby.
The counter runs from **Off** up to **180 min.**
One minute before the TV is set to go to standby, the remaining seconds appear on screen. You can always switch off your set earlier or change the set time.

Child lock

If the child lock is on, the TV can only be switched on with the remote control. The **P** - and + keys on top of the TV cannot be used to select a TV channel. In this way you can prevent unauthorised use of your TV.
If the message **Child lock On** appears, the child lock must be switched off before you can use the **P** - and + keys on top of the TV to select a TV channel.

Subtitle

TV channels with teletext often transmit certain programmes with subtitling. See Teletext, Continuous Subtitles, p. 18 how to select the proper subtitle page from the teletext index.
Select **Subtitle On** or **Off**.

Press the **MENU** key to switch off the Features menu.

Programme list

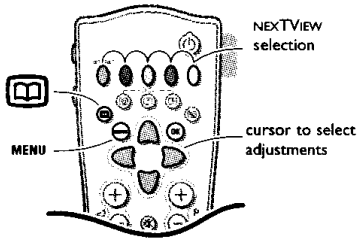
1. Press the **MENU** key to display/cancel the **MAIN MENU**.
2. Select **PROGRAMMES** with the cursor up/down.
3. Press the cursor right to display an overview of all the TV channels installed.
4. Press the cursor up/down to run through the list and press **OK** to select the desired TV channel.
5. Press the **MENU** key to switch off the Programme list.

NEXTVIEW / Teletext Guide

Today, most broadcasters in Europe, are offering teletext pages containing their programme schedule of today. These pages can be requested by switching the TV to **Teletext Guide**.
An increasing number of broadcasters are offering an extended programme guide service called **NEXTVIEW.** NEXTVIEW is a new way of presenting programme schedules and offers more features than common teletext.
With NEXTVIEW it is possible to show for instance all the movies coming tonight.

Both facilities are integrated in this TV: NEXTVIEW and Teletext Programme Guide. If a TV channel supports NEXTVIEW then the TV will automatically present the NEXTVIEW programme schedule. If the TV channel supports just teletext, then the TV will switch automatically to Teletext Guide.
Both facilities are offering the same functions: record, remind and info. However in case of Teletext Guide the broadcaster is responsible if these functions are possible.
You can search for the programmes you want to watch up to 7 days in advance. It is also possible to search for a programme by theme, e.g. sport, movie, etc. Once a programme has been selected it can be tagged, to remind you, or to record on the video recorder automatically (provided the video recorder is equipped with NEXTVIEWLink, level 2.0), once, daily, weekly or series. Teletext Guide/NEXTVIEW also allows direct access to detailed information about programmes if provided by the broadcaster.

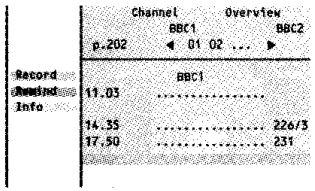
The broadcaster is responsible for the contents of the information.
The TV is responsible for the capture of that information and for the presentation to the user.



Use of the Teletext Guide/NEXTVIEW menus

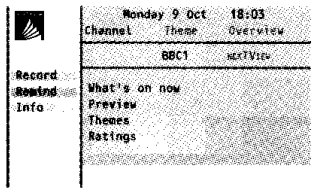
1. Press the key on the remote control to display/cancel the Teletext Guide/ NEXTVIEW menu.
2. Use the cursor in the up/down, left/right directions to select the date, **CHANNEL** for the channel guide, **THEME** for the theme guide, **OVERVIEW** for an overview of all the programmes which are marked as reminders or for recording, the programme guide page number or to enter the programme list.

Teletext Guide

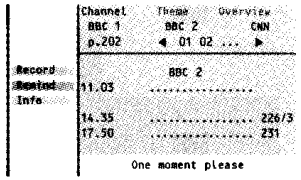


3. Enter the proper programme guide page number with the digit keys or with the – **P** + keys.
4. Press the cursor left/right to run through the subpages.
5. Select a programme with the cursor up/down.
6. Press one of the colour keys to select one of the basic functions (if available); **record, remind, info.** See Basic functions further on.
7. Press the **OK** key to return to the header area again.

NEXTVIEW



3. Select a programme with the cursor up/down.
4. Press one of the colour keys to select one of the basic functions (if available); **record, remind, info.** See Basic functions further on.
5. Press the **OK** key to return to the header area again.



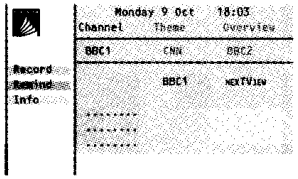
Teletext guide

TV channels which broadcast teletext also transmit a page with the programme guide of the day. For each selected TV channel the programme guide page can be selected with the ▣ key:
- automatically if the selected TV channel supports services like PDC (Programme Delivery Control) or MIP (Magazine Inventory Page).
- if automatic pre-selection is not possible then the index page is displayed and the proper programme guide page number of the selected TV channel has to be entered with the digit keys.

The programme guide page will be stored automatically only if it satisfies Video Programming via Teletext (VPT) requirements.

Every time you press the ▣ key, the programme guide page of the selected TV channel will be available if the TV channel does not support NEXTVIEW.

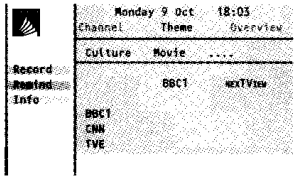
The function items record, remind and info, corresponding with the coloured keys, become highlighted if the displayed programme page satisfies the Video Programming via Teletext (VPT) requirements. Select a programme item and press one of the function keys, e.g. Record or Remind. See Basic functions further on.
The Info item is enabled if the selected programme contains a page number with an optional subcode referring to a page with more info about the programme.



NEXTVIEW modes to sort and represent information

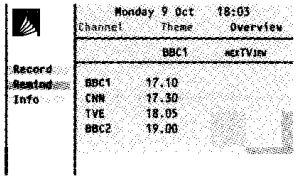
Channel

The Channel guide provides an overview of all programmes that are broadcast by a single channel during one day.
Already passed programmes can be made visible via cursor up.
The list will start with the earliest broadcast programme.
With cursor left/right another favourite TV channel can be selected.



Theme

The theme guide displays a list of all programmes at the selected date, that matches with the selected category (news, sport, culture, movies, ...).
The default starting item will be the current or next programme on the current TV channel.
The **THEME** selection is only present if programmes in the TV guide have defined themes.

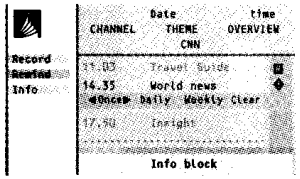


Overview

The Overview menu provides a list of programmes that are marked as reminders or to be recorded each day.
When more than one programme to be recorded has an overlap in time, these programmes will be marked by a red colour.

After the programme has been broadcast, all items set for once will be deleted from the list the following day. This menu can be used to change a reminder or recorder.

Note: the TV will automatically interpret the broadcast time (as shown on the teletext guide) of your selected programme into the correct local time and date.



Basic functions

The functions Record, Remind and Info can be activated with the corresponding colour keys on the remote control.
If the function is not available, then the text is shown at reduced brightness.
Select a programme with the cursor up/down.

Record R or Remind ◆

1. Press the red colour key to activate **Record** or the green colour key to activate **Remind.**
   If the programme number of the broadcaster is not yet known, a message appears with the request to input the correct programme number with the cursor left/right and press OK.
   A small menu pops up in which you can choose the interval: once, daily or weekly, or clear an earlier made record or remind setting. The default interval is set to **Once**. If a programme is an episode of a series, it is identified by the system and the options **daily** and **weekly** are replaced by the option **series**. In this case the system identifies when the next episode of the series will be broadcast. This is not possible in the Teletext guide.
2. Use the cursor in the left/right directions to select the interval.
   The colour of the tag refers to the interval.
3. Press the **OK** key.

When **Record** R is activated:
Storing is displayed to indicate the video recorder is programmed.
When **Remind** ◆ is activated:
- a message will be displayed the moment the tagged programme with ◆ starts, when watching the TV later on.
- the TV switches on the moment the tagged programme with ◆ starts, when the TV is in standby.

Note: Recordings and reminders are not possible when the broadcaster does not transmit dates and times of the programmes.
*The message **No TV programming possible** appears.*
Make sure you are on the TV programming page.

Info

1. Press the yellow colour key to activate **Info.**
   Advertisements or information relating to the selected programme are displayed. In some cases all of the information does not fit on the screen. Use the cursor up/down to browse through all the information.
2. Press the yellow colour key again to switch off the information.

Acquisition and updating of NEXTVIEW information

Acquisition and updating of NEXTVIEW is done when you are watching a TV channel supporting NEXTVIEW.

Video recorder restrictions with NEXTVIEW

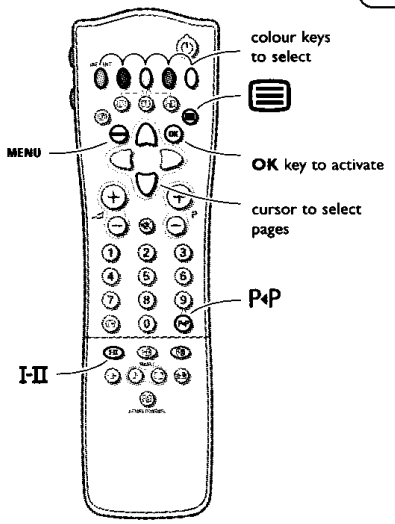
The **Record** item and the automatic recording will only be present and possible if your video recorder is equipped with NEXTVIEWLink.
Your video recorder should be connected to **EXTERNAL 2**. See Connect Peripheral Equipment, p. 19.

The daily, weekly and series options, the number of recordings set and the way overlapping recordings are managed, depend on the type of video recorder you have. When all video recorder timers are full, the item **Record** in the menu will not be present.

Upload video recorder overview *(only with Philips sets)*
When the TV is switched on, the timer recordings are uploaded to the TV to check if any manual addition or deletions have been done. This is shown in the overview.
The video recorder manages and removes timer recordings when performed.

Some NEXTVIEWLink video recorders do not allow a daily programming of the recording to start on a Saturday or Sunday. In this case the item **daily** will be removed from the menu on those days.

Teletext



Most TV channels broadcast information via teletext.
Each channel which broadcasts teletext transmits a page with information on how to use its teletext system. Look for the teletext page with the main index (usually p. 100).
Depending on the TV channel, teletext is transmitted in different systems.
The colours used in the options line correspond with the colour keys of your remote control.

About Easy Text

Easy Text considerably reduces the waiting time (on condition that the teletext broadcast of the particular TV channel is received for at least half a minute) by :

- a direct selection of previous and following pages which are in transmission and of the pages referred to in the options line
- a habit watcher list: frequently used pages are put automatically in a list of preferred pages, so that they are immediately available
- the precapturing of the page numbers referred to in the displayed page
- the precapturing of all the subpages.

Switch Teletext on and off

Press ▤ to switch the teletext on or off.
The main index page appears on the screen together with two information lines at the top and one option line at the bottom of the screen.

Remark: if the displayed teletext characters on screen do not correspond with the characters used in your language, press the **I-II** *key repeatedly to select Language group 1 or 2.*

Select a Teletext page

With the digit keys
Enter the desired page number with the digit keys.
The page counter seeks the page or the page appears immediately when the page number has been stored in the memory.
A message appears when you have entered a non existent or incorrect page number. Page numbers beginning with 0 or 9 do not exist. Choose another number.

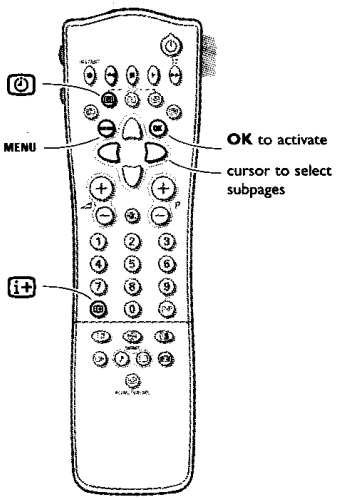
With the option line
Select with the colour keys, corresponding to the coloured options at the bottom of the screen, the desired subject.

Quickly run through the teletext pages

Press the cursor up/down or the **- P +** key to run through the previous or the following pages.

Select the previously selected txt page

Press the P↺P key.



Select the index teletext page

Press the white colour key to display the main index (usually p.100).

Only for T.O.P teletext broadcasts :
T.O.P orders the pages in categories and adds other possibilities of enhancing ease of use.
Press [i+]. A T.O.P. overview of the teletext subjects available is displayed.
Not all TV channels broadcast T.O.P. teletext. When the teletext system is not T.O.P. teletext, a message appears at the top of the screen.
Select with the cursor up/down, left/right the desired subject and press the **OK** key.

Select subpages

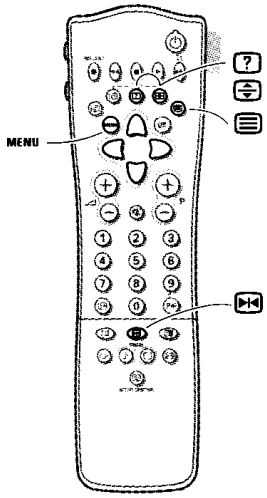
When a selected teletext page consists of different subpages, one of the subpages appears on the screen.
The coloured number in the first information line refers to the displayed subpage.
The other subpages can be selected in 2 ways :

With the cursor left/right
The other subpage numbers appear in white as soon as the transmission has found them. They are stored in the memory so that they are available while the teletext page is on screen.
Select with the cursor left/right the previous or the following subpage.

With the [0] key
• Enter the subpage number yourself:
Press [0]. Enter the desired subpage with the digit keys : e.g. 3 for the third page of seven subpages.
The TV searches for the selected subpage.

• Automatically rotating subpages:
Press [0] again to cancel the entered digit key for the subpage.
Now the subpages rotate automatically.

Press [0] again to select the subpages with the cursor left/right again.



Special teletext functions

Hold
Press [⏭] to stop the automatically rotating of the subpages or to stop the page counter from seeking when you have entered a wrong page number or when the page is not available.
Enter another page number.

Enlarge
Press [⊕] repeatedly to display the upper part, the lower part and then to return to the normal page size. When the upper part is displayed, you can scroll the text, line by line using the cursor up/down.

Reveal
Press [?] to reveal/conceal the hidden information, such as solutions to riddles and puzzles.

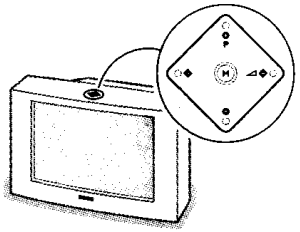
Select Continuous Subtitles

TV channels with teletext often transmit programmes with subtitling. For each TV channel you can store a subtitle page which will be displayed continuously if the programme being broadcast is transmitted with subtitles.

Switch on teletext and select the proper subtitle page from the index.
Switch off teletext.
Now the subtitle page is stored for the selected TV channel.

Once subtitles have been stored and **Subtitle On** has been selected they will automatically be displayed on the selected TV channel if subtitles are in the transmission.
Select **Subtitle On** or **Off** in the Features menu, see p. 11.
The subtitle symbol [▭] appears when **Subtitle On** is selected.

Remark: you are in teletext mode, so only teletext functions are available.



Keys on top of the TV

Should your remote control be lost or broken you can still change some of the basic picture settings with the keys on top of the TV.

Press the **M** key repeatedly to select **Volume**, **Brightness**, **Colour**, **Contrast**.
Press the **P** - or + keys to carry out the selected adjustment.
When the menu adjustment is not displayed, the **P-** or **+** keys enable you to select the TV channels, the ◢ - or + keys to adjust the volume.

The selected adjustment automatically switches off when no action has been executed for 10 seconds.

Connect Peripheral Equipment

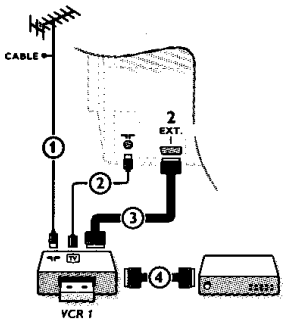
There is a wide range of audio and video equipment that can be connected to your TV. The following connection diagrams show you how to connect them.

Video recorder

Connect the aerial cables ①, ② and, to obtain the optimum picture quality, eurocable ③ as shown opposite.

easyLINK

If your video recorder is provided with the EasyLink function, the eurocable supplied with it should be connected to **EXTERNAL 2** *to benefit from the EasyLink functionality.*



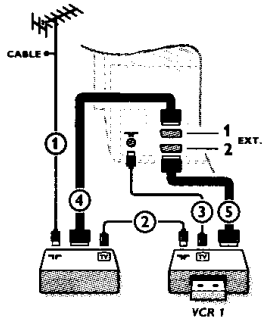
If the eurocable ③ is not used the following steps are required:

Search for and store the test signal of the video recorder

1. Unplug the aerial cable ① from the aerial socket ⊤ of your video recorder.
2. Switch on your TV and put the video recorder on the test signal. (See the handbook for your video recorder.)
3. Search for the test signal of your video recorder in the same way as you searched for and stored the TV signals. See Installation, Searching for and storing TV channels, Manual installation, p. 5.
4. Store the test signal under programme number 0 or between 90 and 99.
5. Replace the aerial cable in the aerial socket ⊤ of your video recorder after you have stored the test signal.

Decoder and video recorder
Connect a eurocable ④ to your decoder and to the special euroconnector of your video recorder. See also the video recorder handbook.
See Define Decoder/Descrambler prog. numbers, p. 7.
You can also connect your decoder directly to **EXTERNAL 1** or **2** with a eurocable.

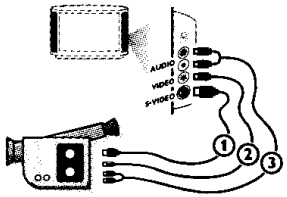
Video recorder and other peripherals (except Digital Sources)



1. Connect the aerial cables ①, ② and ③ as shown opposite. Better picture quality can be obtained if you also connect eurocable ⑤ to **EXTERNAL 2** and a eurocable ④ to **EXTERNAL 1**.
2. Look for the test signal of your peripheral in the same way as you do for a video recorder.

When a video recorder is connected to **EXTERNAL 1** *you can only record a programme from your TV.*
Only when a video recorder is connected to **EXTERNAL 2** *it is possible to record a programme from your TV as well as from other connected equipment. See Record with your video recorder, p. 24.*

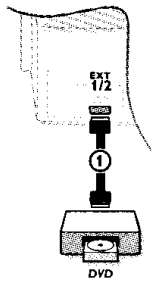
Note: EXTERNAL 1 can handle CVBS and RGB, EXTERNAL 2 CVBS and Y/C.



Camera & camcorder

1. Connect your camera or camcorder to sockets at the right side of your TV.
2. Connect the equipment to **VIDEO** ② and **AUDIO L** ③ for mono equipment.
   Press the I-II key repeatedly to select the sound coming from one or both loudspeakers of your TV.
3. For stereo equipment also connect **AUDIO R** ③.

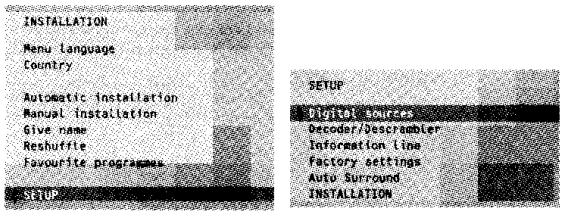
S-VHS quality with an S-VHS camcorder is obtained by connecting the S-VHS cables with the **S-VIDEO** input ① and **AUDIO** inputs ③.



Digital equipment (DVD, digital satellite tuner,...)

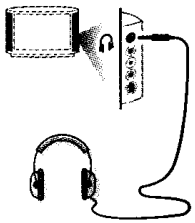
Connect your digital equipment with a eurocable ① to one of the euroconnectors (**EXT1** or **EXT2**), or with a cinch cable to the **VIDEO** input at the right side of the TV (see illustration above).

1. Press ⓞ and ⊕ at the same time.



2. Select **Digital sources** in the Setup menu of the **INSTALLATION** menu and select:
   - **None** if you have no digital source connected,
   - **EXT1** or **EXT2** if you have connected your equipment to a euroconnector,
   - **FRONT** in case you have connected your equipment to the right side of the TV.
3. Press the **MENU** key to switch off all menus.

Note: the low quality of some digital picture material may be the cause of digital image distortion. In this case select **Eco** *under the* ***SMART PICTURE*** ☐ *key on the remote control as this setting is intended to improve distorted picture quality.*

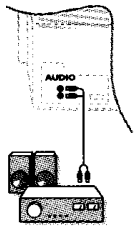


Headphone

1. Insert the plug into the headphone socket 🎧 at the right side of the TV.
2. Press 🔇 on the remote control to switch off the internal loudspeakers of the TV.

The headphone impedance must be between 8 and 4000 Ohm.
The headphone socket has a 3.5 mm jack.

In the **SOUND** menu select **Headphone volume** to adjust the headphone volume, see p. 10.



Audio equipment / Amplifier

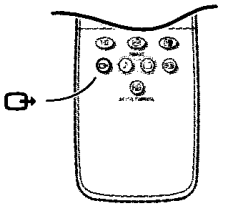
Connect the audio cables to the audio input of your audio equipment and to **AUDIO L** and **R** at the back of your TV.

You can listen to your TV sound via your audio equipment.

If you want to connect more equipment to your TV, consult your dealer.

To select connected equipment

easyLINK



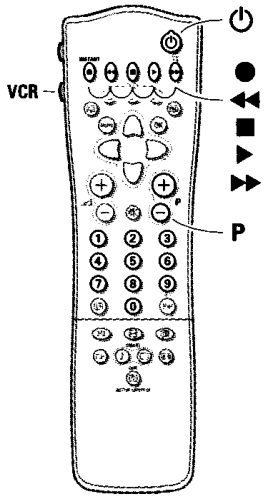
If the TV is connected to a video recorder with the EasyLink function, in some cases the TV will be switched on, even when it was in standby. (E.g. playback tape,...)
This is not possible when Child lock On is selected.

Equipment connected with an aerial cable only :
Select the programme number under which you have stored the test signal with the digit keys.

Equipment connected to a euroconnector or to the right side of the TV
Press the ⮕ key repeatedly to select **EXT1**, **EXT2** or **FRONT**, according to where you connected your equipment at the back or the right side of your TV.
Remark : Most equipment (decoder, video recorder, satellite receiver) carries out the switching itself.

If you want to change to TV channels?
Enter the programme number of the TV channel which you want to watch with the digit keys or press the ⮕ key repeatedly to select **TV**.

Audio and video equipment keys



Most of the audio and video equipment from our range of products can be operated with the remote control of your TV.

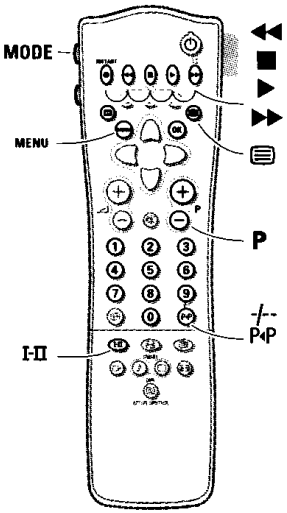
Video recorder
Keep the **VCR** key on the left side of the remote control pressed and simultaneously press:

- ● for record,
- ◀◀ for rewind,
- ■ for stop,
- ▶ for play,
- ▶▶ for fast forward,
- -/-- for selecting 1- or 2-digit programme numbers from the video recorder,
- - P + for sequential programme selection from the video recorder tuner,
- 0 to 9 to select a programme number from your video recorder tuner,
- ⏻ to switch the video recorder to standby

These keys function with equipment which use the RC5 signalling standard.

easyLINK

If your video recorder has the EasyLink function, the key **INSTANT** ● *for recording, can be operated in the TV mode.*
If your EasyLink video recorder has the system standby function, when you press the ⏻ *key for 3 seconds, both TV and the video recorder are switched to standby.*



Satellite receiver

Press the **OK** key simultaneously with the digit key 1.
Now you can operate your satellite receiver with the remote control of your TV.

Keep the **MODE** key on the left side of the remote control pressed and simultaneously press:

MENU to switch the **SAT** menu on or off
-/-- to select a one or two digit programme number from the satellite receiver.

These keys function with equipment which use the RC5 signalling standard.

DVD player

Press the **OK** simultaneously with the digit key 2.
Now you can operate your DVD player with the remote control of your TV.

Keep the **MODE** key on the left side of the remote control pressed and simultaneously press:

MENU to switch the DVD menu on or off
to select a DVD title
P•P to select a DVD chapter
I-II to select your choice of audio language
◀◀ to search down
■ stop
▶ play
▶▶ to search forward
0-9 to select a programme number from your DVD
OK to enter the selected menu item

●, ⏲, ?, ⊞, ⊐ have no function

Note: after replacing the batteries the default operational equipment is the satellite receiver.

These keys function with equipment which use the RC6 signalling standard.

Record with your video recorder

To record S-VHS quality, connect an S-VHS peripheral directly to the video recorder.

Record a TV programme

1. Select the programme number on your video recorder.
2. Set your video recorder to record.
   See the handbook for your video recorder.

Switching programme numbers on your TV does not disturb recording !

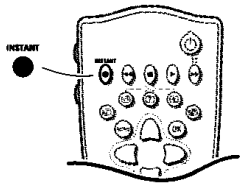
Record a programme on your video recorder connected to EXTERNAL 2 from Audio/Video equipment connected to EXTERNAL 1 or to sockets on the right side of the TV

1. Switch on the equipment.
2. Select the right external on your video recorder.
3. Set your video recorder to record.
   You record what you are watching on the screen.

Do not switch programme numbers or do not switch off your TV when you are recording !

Record with your video recorder with EasyLink

easyLINK



If you have connected an S-VHS video recorder provided with the EasyLink function, you can record S-VHS-quality from an S-VHS peripheral connected to the right side of the TV. (E.g. from an S-VHS camcorder.)

In TV mode, it is possible to start a direct recording of the programme which is being displayed on the TV screen.
Press the **INSTANT** ● *record key of the remote control.*
The video recorder switches on from standby and a message of what is being recorded appears on the screen.
The video recorder starts recording the programme you are watching.
Switching programme numbers on your TV does not disturb recording !

When recording a programme from a peripheral connected to EXTERNAL 1 or FRONT, you can not select another TV programme on the screen.
To watch TV programmes again, press the programme number you want to select twice.
Attention: the recording is stopped and your video recorder switches to standby.

Record with your video recorder with NEXTVIEWLink

If your video recorder is equipped with NEXTVIEWLink, and you tagged one or more programmes to be recorded automatically in the NEXTVIEW mode, it is not necessary for the TV to be in the standby mode or switched on for the recording to start.

4. Mechanical instructions

4.1 Accessing the service connector (for ComPair)

1. Remove the 'Service Connector' cover, see Figure 4.1.
2. Connect the ComPair cable (for more info see chapter 5).
3. Start ComPair and perform the diagnosis.

4.2 Removing the Rear Cover

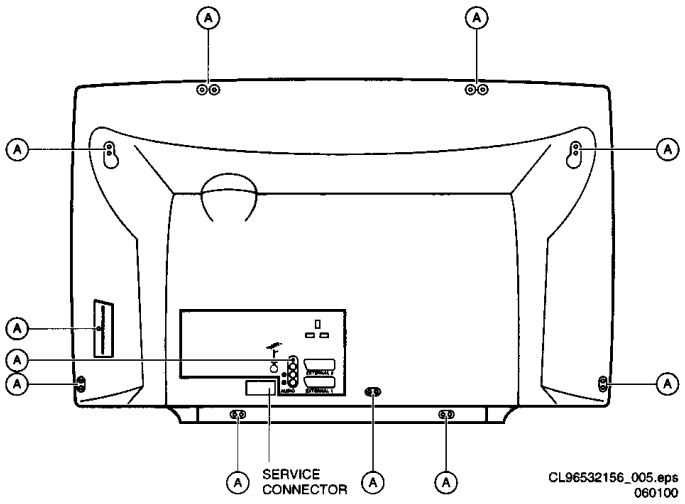


Figure 4-1

1. Remove the fixation screws (A) of the rear cover, notice also the screw for the side-I/O.
2. Now the rear cover can be removed.

4.3 Service position

The following PWB's are present in this chassis (see also 'Chassis overview', chapter 1):

1. Large Signal Panel (LSP)
2. Small Signal Board (SSB)
3. Top Control panel
4. CRT panel (or PTP)
5. Side I/O panel
6. Mains Switch/LED panel

4.3.1 Service position LSP

Position 1: For better accessibility of the LSP, do the following (figure 4.2):

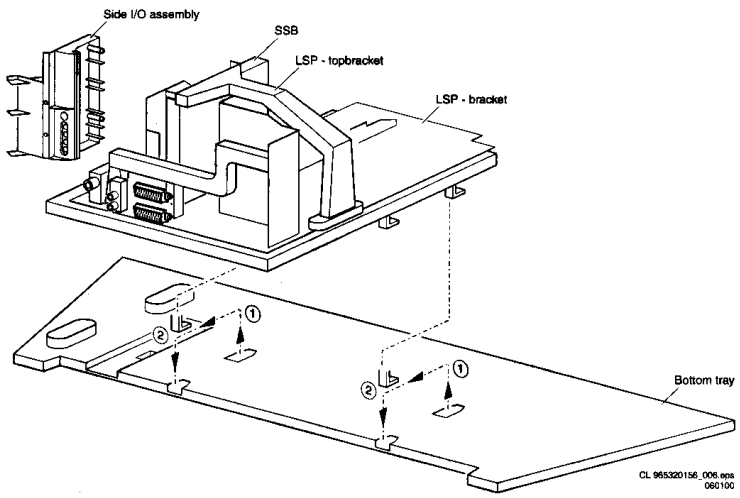


Figure 4-2

1. Remove the LSP-bracket from the bottom tray by pulling it backwards.
2. Hook the bracket in the first row of fixation holes of the bottom tray. In other words reposition the bracket from (1) to (2).

Position 2: To get access to the bottom side (solder side) of the LSP, do the following (figure 4.3):

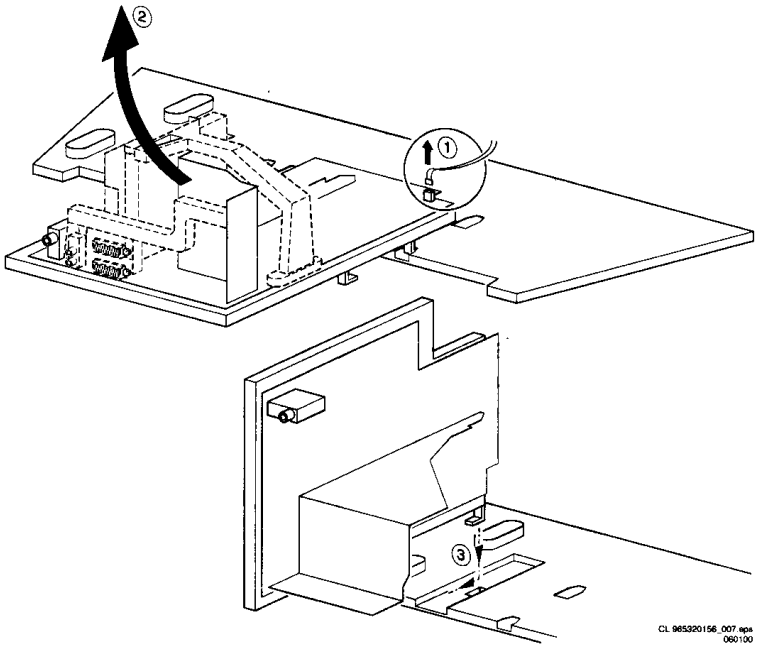


Figure 4-3

1. Disconnect the degaussing coil from the LSP by removing the cable on connector 0020 (1).
2. Release the wiring from the heatsink fixation clamps, in order to get room for repositioning the LSP.
3. Turn the LSP 90 degrees clockwise (2) and place it in the fixation hole at the left side of the bottom tray (3).

4.3.2 Service position SSB

In fact there is no predefined service position for the bottom (B-) side of the SSB. All relevant test points are located on the A-side (side that is facing the Tuner).
If IC's must be replaced: take the complete panel out of the SIMM-connector.
To get access to the SSB test points, do the following:

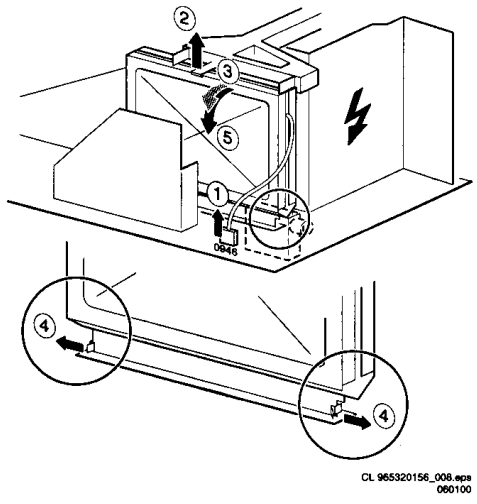


Figure 4-4

1. Put the LSP in service position 1 (as described above).
2. Disconnect the IF-cable from connector 0946 (1).
3. Release the 'top fixation clamp' which holds the SSB (2) and pull the SSB slightly towards the Tuner (3). At the same time, the 2 metal clamps at both sides of the SIMM-connector must be released (4) and the complete SSB can be taken out now by pulling the top-side of the SSB towards the Tuner (5). It 'hinges' in the SIM-connector.

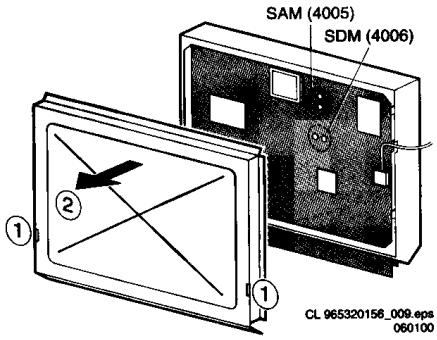


Figure 4-5

1. Once the SSB has been taken out of the connector, the A-side shielding can be removed.
2. After removal of the shielding, the panel can be replaced in its connector in reverse order. Don't forget to reconnect the IF-cable.
3. If necessary for the measurement, the LSP can be put in 'service position 2' (as described above).

4.3.3 Accessing the Top Control panel

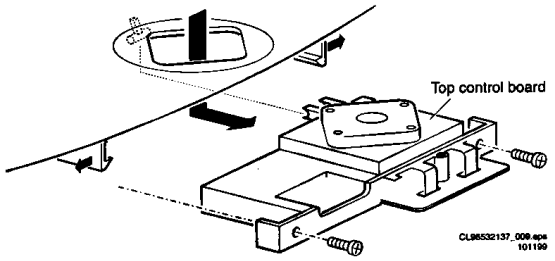


Figure 4-6

1. Remove the two screws.
2. Pull the board backward.

4.3.4 Accessing the Side I/O panel

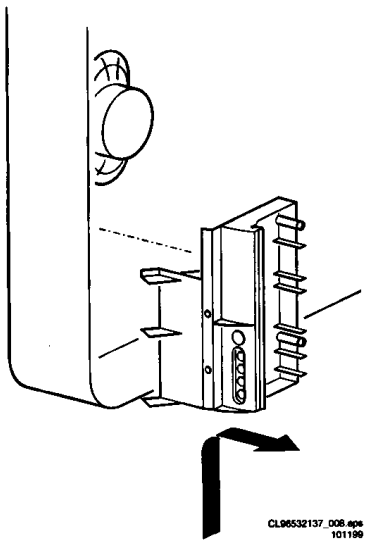


Figure 4-7

1. The complete Side I/O-assembly can be lifted out of the hinge for servicing.
2. The board can easily be removed out of the bracket by releasing the fixation clamps.

4.3.5 Accessing the Mains Switch/LED panel

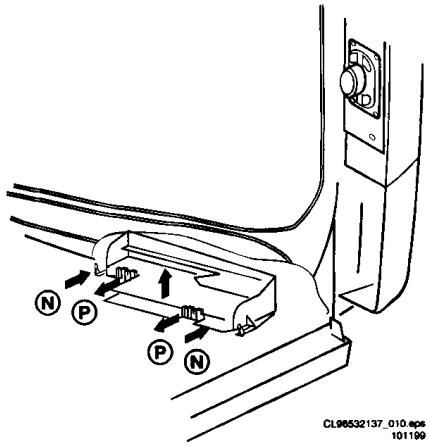


Figure 4-8

1. Release the two fixation clamps (N) by pushing them upward.
2. At the same time, the complete assy must be pulled backward (P).
3. If necessary, the light guide can be replaced now.
4. The 'Mains Switch/LED'-panel can be removed now by releasing the clamps of the bracket.

4.4 Mounting the Rear Cover

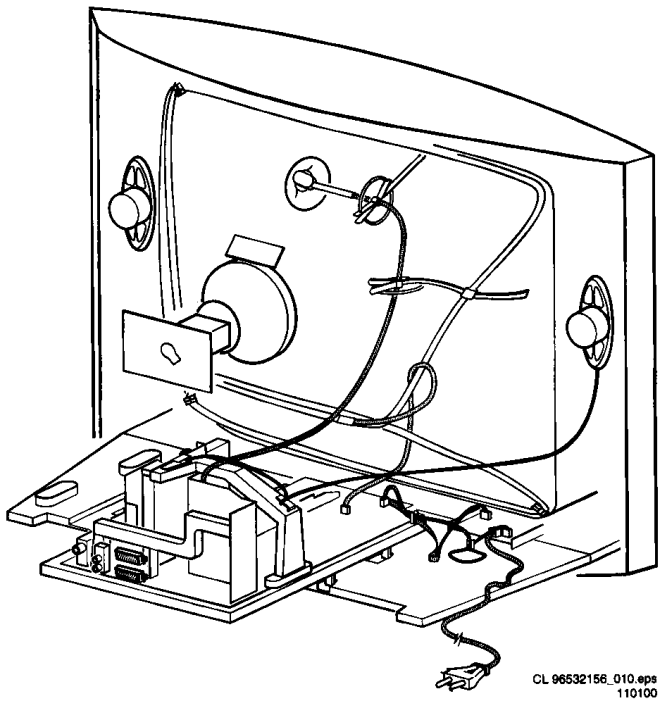


Figure 4-9

Before mounting the Rear Cover, some checks has to be performed:

- Check whether the Mains Cord is mounted correctly in the guiding brackets.
- Check whether all cables are replaced in their original position. This is very important due to the large 'hot' area of the set. Special attention must be paid to the right Loudspeaker cable and the degaussing cable.

5. Service modes, error codes, protections, faultfinding and repair tips

In this chapter the following paragraphs are included:
1. Test points.
2. Service modes.
3. Problems and solving tips (related to CSM).
4. ComPair.
5. Error codes.
6. Protections.
7. Repair tips.

5.1 Test points

The EM2E chassis is equipped with test points in the service printing. These test points are referring to the functional blocks:
- P1-P2-P3, etc. on LSP: Test points for the power supply.
- L1-L2-L3, etc. on LSP: Test points for the line drive and line output circuitry.
- F1-F2-F3, etc. on LSP: Test points for the frame output circuitry.
- R1-R2 on LSP: Test points for the rotation circuitry.
- A1-A2-A3, etc.: Test points for the audio circuitry.
- I1-I2-I3, etc. on SSB:Test points for the Tuner/IF part.
- S1-S2-S3, etc. on SSB: Test points for the synchronisation circuitry.
- V1-V2-V3, etc. on SSB: Test points for the video processing circuitry.
- C1-C2-C3, etc. on SSB: Test points for the control and teletext circuitry.
- F1F-F2F-F3F, etc.: Test points for the CRT-panel circuitry.
- SC1-SC2-SC3, etc: Test points for the SCAVEM circuitry.

The numbering is done in a for diagnostics logical sequence; always start diagnosing within a functional block in the sequence of the relevant test points for that functional block.

5.2 Service modes and ComPair

5.2.1 Service Default Mode (SDM)

The purpose of the SDM is to provide a situation with predefined settings to get the same measurement results as given in this manual.

Specification of the SDM:
- Tuning frequency 475.25 MHz.
- TV-system for BGLM sets set to BG.
- All picture settings at 50 % (brightness, colour, contrast, hue).
- All sound settings at 50 % except volume at 25 % (so bass, treble, balance at 50 %, volume at 25 %).
- All service-unfriendly modes are disabled (like sleep timer, child lock, blue mute, AVL and SDLP).

Entering the SDM can be done in 4 ways:
- Via a standard RC-handset by entering the code '062596' followed by the 'MENU' button (it is possible that, together with the SDM, the main menu will appear. To switch it off, push the 'MENU' button again).
- Via ComPair.
- By the 'DEFAULT' button on the DST while the set is in the normal operation mode.
- By short-circuiting for a moment the two solder-pads with the indication 'SDM' (item 4006) on the A-side of the SSB (activation can be performed in all modes except when the set has a problem with the main-processor).

Note: If the SDM is entered via the pins, all the software-controlled protections are de-activated.

Exiting the SDM can only be done via the STANDBY command. By switching off-on the set with the mains switch the set will come up again in the SDM.

5.2.2 Service Alignment Mode (SAM)

The purpose of the SAM is to align the set and/or adjust the settings.

Specification of the SAM:
- Software alignments (see chapter 8).
- Option settings (see chapter 8).
- Error buffer reading and erasing. The most recent error code is displayed on the left side.
- Operation counter.
- Software version.

Entering the SAM can be done in 4 ways:
- Via a standard RC-handset by entering the code '062596' followed by the 'OSD' button [i +] (it is possible that, due to the button sequence, the channel will change to channel 9. To return to the channel of your selection, push the appropriate button on the RC).
- Via ComPair.
- By the 'ALIGN' button on the DST while the set is in the normal operation mode (or SDM). Enter the password '3140' and press OK.
- By short-circuiting for a moment the two solder-pads with the indication 'SAM' (item 4005) on the A-side of the SSB (activation can be performed in all modes except when the set has a problem with the main-processor).

Note: If the SAM is entered via the pins, all the software controlled protections are de-activated.

The Service Alignment Mode menu will now appear on the screen. The following information is displayed:
- Date: the software date.
- ID: the software version of the ROM (Example: EM2E11.0_01501. This software-code stands for EM2E (chassis), E = Europe, 1 = language, 1.0 = software version, xxxxx = latest 5 digits of 12nc code software).
- Operation Hours: the accumulated total of operation hours.
- Errors: followed by maximal 10 errors. The most recent error is displayed at the upper left. For explanation errors see (table 5.1).
- Defect. Module: here the module that generates the error is displayed. If there are multiple errors in the buffer that have not all been generated by a single module, there is probably another defect. The message 'Unknown' will then be displayed here.
- Reset Error Buffer: pressing the 'OK' key can reset the error buffer.
- Functional Test: all devices are tested via the 'OK' key. Eventual errors are displayed in the error buffer. The error buffer is not erased, the content returns when the Functional Test is terminated.
- Alignments: this enables the Alignments sub-menu to be called up.
- Dealer Options: extra features for dealers.

Exiting the SAM can be done via the 'MENU' command or via switching OFF-ON the set with the mains switch.

5.2.3 Customer Service Mode (CSM)

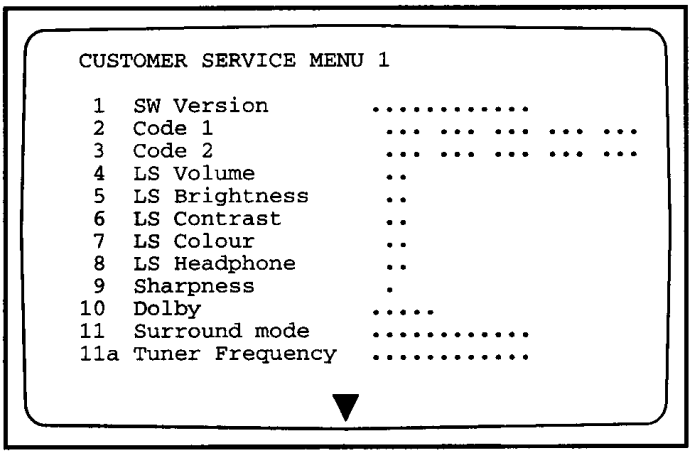
All EM2E sets are equipped with the 'Customer Service Mode' (CSM). This 'Customer Service Mode' is a special service

mode, which can be activated and deactivated by the customer upon request of the service technician/dealer during a telephone conversation in order to identify the status of the set. This CSM is a 'read only' mode, therefore modifications in this mode are not possible.

Switching-on of the Customer Service Mode:
The Customer Service Mode will switch-on after pressing simultaneously the 'MUTE' knob on the remote control handset and the 'MENU' button on the TV for at least 4 seconds. This activation only works if there is no menu on the screen.

Switching-off the Customer Service Mode:
The Customer Service Mode will switch-off after pressing any key of the remote control handset (with exception of the 'cursor-up' and 'cursor-down' keys), or the buttons on the TV or by switching off the TV set with the mains switch.

Detailed explanation of the Customer Service Mode
After switching on the Customer Service Menu the following screen will appear:


CUSTOMER SERVICE MENU 1
1 SW Version .....
2 Code 1 ... ...
3 Code 2 ... ...
4 LS Volume ..
5 LS Brightness ..
6 LS Contrast ..
7 LS Colour ..
8 LS Headphone ..
9 Sharpness .
10 Dolby .....
11 Surround mode .....
11a Tuner Frequency .....

CL96532137_024.eps
101199

Figure 5-1

Note: Following text is an explanation of the CSM. Be aware that these descriptions are depending on the set hardware.

Line 1:
Software version; the build in software version (AAABCX.Y)
- AAA = chassis name (EM1 = Painter processor, EM2 = OTC processor)
- B = country (E = Europe, A = Asian Pacific, U = USA)
- C = 1 (language cluster)
- X = main version number
- Y = sub version number

Details on the software version can be found in the chapter 'Software Survey' of the publication 'Product Survey - Colour Television'.

Line 2:
Code 1; gives the last 5 errors of the error buffer. As soon as the built-in diagnose software has detected an error the buffer is adapted.

Line 3:
Code 2; gives the first 5 errors of the error buffer. As soon as the built-in diagnose software has detected an error the buffer is adapted.
The last occurred error is displayed on the leftmost position of code 2. Each error code is displayed as a 3 digit number. When less than 10 errors occur, the rest of the line(s) is (are) empty. In case of no errors the text 'No Errors' is displayed. See paragraph 5.5 of this chapter for a description of the error codes.

Line 4:
LS Volume; gives the Last Status of the volume as set by the customer for this selected transmitter. The value can vary from 0 (volume is minimum) to 24 (volume is maximum). Volume values can be changed via the volume key on the remote control handset.

Line 5:
LS Brightness; gives the Last Status of the brightness as set by the customer for this selected transmitter. The value can vary from 0 (brightness is minimum) to 63 (brightness is maximum). Brightness values can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Brightness'.

Line 6:
LS Contrast; gives the Last Status of the contrast as set by the customer. The value can vary from 0 (contrast is minimum) to 63 (contrast is maximum). Contrast values can be changed via 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Contrast'.

Line 7:
LS Colour; gives the Last Status of the colour saturation, as set by the customer. The value can vary from 0 (colour is minimum) to 63 (colour is maximum). Colour values can be changed via 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Colour'.

Line 8:
LS Headphone; gives the Last Status of the headphone volume, as set by the customer. The value can vary from 0 (volume is minimum) to 24 (volume is maximum). Headphone volume values can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'SOUND' and 'Headphone'.

Line 9:
Sharpness; gives the sharpness value. The value can vary from 0 (sharpness is minimum) to 7 (sharpness is maximum). In case of bad antenna signals a too high value of the sharpness can result in a noisy picture. Sharpness values can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'PICTURE' and 'Sharpness'.

Line 10:
Dolby; indicates whether the received transmitter transmits Dolby sound (present) or not (not present). Attention: The presence of Dolby can only be tested by the software on the Dolby Signalling bit. If a Dolby transmission is therefore received without a Dolby Signalling bit, then this indicator will show 'not present' even though such a Dolby transmission is received.

Line 11:
Surround Mode; indicates the by the customer selected surround mode. In case the set is a Non-Dolby set there will be displayed '0'. If it is a Dolby-set then is displayed: 'Pro Logic', 'Dolby 3 Stereo', 'Hall' or 'Off'. For Dolby-set surround mode can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'SOUND' and 'Surround settings'.

Line 11a:
Tuner Frequency; indicates the frequency the selected transmitter is tuned to. The tuner frequency can be changed via the "cursor left" and "cursor right" keys for fine tune or by entering directly with the digit keys 0 to 9 on the remote control

handset after opening the installation menu and selecting "manual installation".
The installation menu can be opened by pressing "timer" and "enlarge" at the same time.

By means of the 'cursor-down' knob on the remote control handset the Customer Service Menu 2 will appear. By means of the 'cursor-up' knob on the remote control handset the Customer Service Menu 1 will appear again.
Customer Service Menu 2 represents following information:

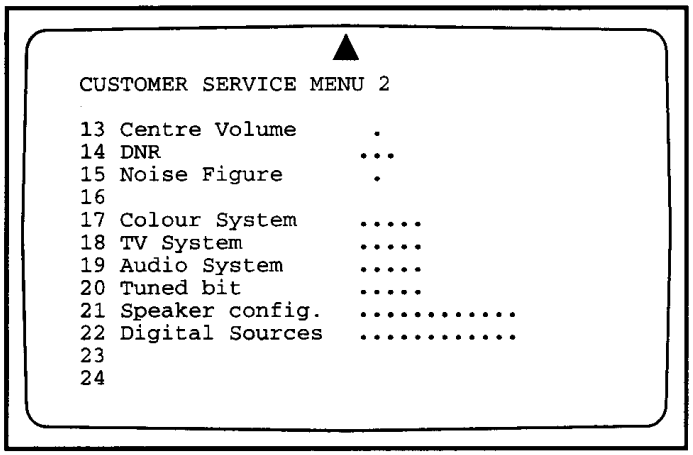


Figure 5-2

Line 13:
Centre Volume; gives the volume value of the centre loudspeakers. This value can vary from 0 (minimum volume) to 63 (maximum volume). Centre volume can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after pressing the 'MENU' button and selecting 'SOUND', 'Dolby Pro Logic' and 'Centre volume'. This feature is only available when surround mode is in 'Dolby Pro Logic' or 'Dolby 3 Stereo'.

Line 14:
DNR; gives the setting of the DNR for the selected transmitter. The following selections are possible:
'off', 'min', 'med' or 'max'. The DNR is changed automatically when 'Active Control' is 'ON'.

Line 15:
Noise Figure; gives the noise ratio for the selected transmitter. This value can vary from 0 (good signal) to 127 (average signal) and to 255 (bad signal).

Line 16:
Digital Option; gives the selected digital mode, '100 Hz' or 'Digital Scan'. Digital option can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset, after pressing the "MENU' button and selecting 'PICTURE', 'Digital Options'.

Line 17:
Colour System; gives information about the colour system of the selected transmitter.
- Black and white: No colour carrier received
- PAL: PAL signal received
- SECAM: SECAM signal received
- NTSC: NTSC signal received

Line 18:
TV System; gives information about the video system of the selected transmitter.
- BG: BG signal received
- DK: DK signal received
- I: PAL I signal received
- L: SECAM L signals received
- M38.9: NTSC M signal received with video carrier on 38.9 MHz
- MN: NTSC M signal received

Line 19:
Audio System; gives information about the audio system of the selected transmitter.
- Sound Muted: No sound
- Dolby Pro Logic: Dolby Pro Logic sound received
- Mono: Mono sound received
- Stereo: Stereo sound received
- Dual I: Language I received
- Dual II: Language II received
- Digital Mono: Digital mono sound is received
- Digital Stereo: Digital stereo sound is received
- Digital Dual I: Digital language I is received
- Digital Dual II: Digital language II is received

Line 20:
Tuned bit; gives information about the tuning method of the stored pre-set. If the value is 'Yes' the pre-set is stored via manual entry of the frequency when a transmitter was not present on that frequency. In that case the TV will attempt to perform a micro-search every time the pre-set number is selected. Once the micro-search has been successful the Tuned Bit will be set to 'No'.

Line 21:
Speaker config.; gives the configuration setting for the speakers. In case the set is a Non-Dolby set there will be displayed '0'. If it is a Dolby-set then is displayed: 'Full internal', 'L/R external', 'Surround external' or 'Full external'. For the Dolby-set the speaker configuration can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after opening the installation menu and selecting 'SETUP'. The installation menu can be opened by pressing 'timer' and 'enlarge' at the same time. This feature is only available when the set has virtual Dolby.

Line 22:
Digital Sources; gives the configuration setting for the digital source. This can be 'FRONT', 'EXT1', 'EXT2' or 'None'. If one of these is selected the starting point is a top quality signal on that input and a number of settings are therefore changed automatically. The digital source can be changed via the 'cursor left' and 'cursor right' keys on the remote control handset after opening the installation menu and selecting 'SETUP'. The installation menu can be opened by pressing 'timer' and 'enlarge' at the same time.

5.3 Problems and solving tips

Below described problems are all related to TV-settings. The procedures to change the value or the status of the different settings are described in the paragraph 'Detailed explanation of the Customer Service Mode'.

5.3.1 Picture problems

Worse picture quality in case of DVD pictures
Check line 22 'Digital sources'. In case line 22 gives the indication 'Not Present' change the setting into 'Present'.

Snowy/noisy picture
1. Check line 15 'Noise Figure'. In case the value is 127 or higher and the value is also high on other programs check the aerial cable/aerial system.

2. Check lines 9 'Sharpness' and 15 'Noise Figure'. In case the value of line 9 is 3 or 4 and the value of line 15 is high (127 or higher), lower the value of line 9 'sharpness'.

Picture too dark
1. Press 'Smart Picture' button on the Remote Control handset. In case picture improves, raise the brightness value or raise the contrast value. The new value(s) are automatically stored for all TV channels.
2. After switching on the Customer Service Mode the picture is OK. Raise the brightness value or raise the contrast value. The new value(s) are automatically stored for all TV channels.
3. Check lines 6 'LS Brightness' and 7 'LS Contrast'. The value of line 6 is low (<10) or the value of line 7 is low ((10). Raise the brightness value or raise the contrast value.

Picture too bright
1. Press 'Smart Picture' button on the Remote Control handset. In case picture improves, reduce the brightness value or reduce the contrast value. The new value(s) are automatically stored for all TV channels.
2. After switching on the Customer Service Mode the picture is OK. Reduce the brightness value or reduce the contrast value. The new value(s) are automatically stored for all TV channels.
3. Check lines 6 'LS Brightness' and 7 'LS Contrast'. The value of line 6 is high (>40) or the value of line 7 is high ((50). Reduce the brightness value or raise the contrast value.

White line around picture elements and text
1. Press 'Smart Picture' button on the Remote Control. In case picture improves, reduce the sharpness value. The new value(s) are automatically stored for all TV channels.
2. After switching on the Customer Service Mode the picture is OK. Reduce the sharpness value. The new value(s) are automatically stored for all TV channels.
3. Check line 8 'Sharpness'. Reduce the sharpness value. The new value(s) are automatically stored for all TV channels.

No picture
Check line 20 'Tuned bit'. In case the value is 'Yes', install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation.

Blue picture
No proper signal is received. Check the aerial cable/aerial system.

Blue picture and/or unstable picture
A scrambled or decoded signal is received.

Black and white picture
Check line 5 'LS colour'. In case the value is low ((10) raise the value of colour. The new value(s) are automatically stored for all TV channels.

No colours/colour lines around picture elements
1. Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'PAL' and line 18 is 'M38.9', the installed system for this pre-set is 'USA', while 'West Europe' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; West Europe'.
2. In case line 17 is 'PAL' and line 18 is 'L', the installed system for this pre-set is 'France', while 'West Europe' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; West Europe'.

No colours/noise in picture
1. Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'Black and White' and line 18 is 'BG', the installed system for this pre-set is 'West Europe', while 'USA' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; USA'.
2. In case line 17 is 'Black and White' and line 18 is 'L', the installed system for this pre-set is 'France', while 'USA' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; USA'

Colours not correct
Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'PAL' and line 18 is 'L', the installed system for this pre-set is 'France', while 'West Europe' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; West Europe'.

Colours not correct/unstable picture
Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'SECAM' and line 18 is 'BG', the installed system for this pre-set is 'USA', while 'France' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; France'.

Unstable picture
Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'SECAM' and line 18 is 'M 38,9', the installed system for this pre-set is 'West Europe', while 'France' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; France'.

Menu text not sharp enough
1. Press 'Smart Picture' button on the Remote Control handset. In case picture improves, reduce the contrast value. The new value(s) are automatically stored for all TV channels.
2. After switching on the Customer Service Mode the picture is OK. Reduce the contrast value. The new value(s) are automatically stored for all TV channels.
3. Check line 7 'LS Contrast'. The value of line 7 is high (>50). Reduce the contrast value.

5.3.2 Sound problems

No sound from left and right speaker
1. Press 'Smart Sound' button on the Remote Control handset. In case sound improves, raise the volume value. The new value(s) are automatically stored for all TV channels.
2. After switching on the Customer Service Mode the volume is OK. Raise the volume value. The new value(s) are automatically stored for all TV channels.
3. Check line 4 'LS Volume'. The value is low. Raise the value of 'Volume'. The new value(s) are automatically stored for all TV channels.

Sound too loud for left and right speaker
1. Press 'Smart Sound' button on the Remote Control handset. In case sound improves, reduce the volume

value. The new value(s) are automatically stored for all TV channels.
2. After switching on the Customer Service Mode the volume is OK. Reduce the volume value. The new value(s) are automatically stored for all TV channels.
3. Check line 4 'LS Volume'. The value is high. Reduce the value of 'LS Volume'. The new value(s) are automatically stored for all TV channels.

5.4 ComPair

5.4.1 Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the DST service remote control allowing faster and more accurate diagnostics. ComPair has three big advantages:

- ComPair helps you to quickly get an understanding how to repair the EM2E in short time by guiding you step by step through the repair procedures.
- ComPair allows very detailed diagnostics (on I^2C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I^2C commands yourself; ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the EM2E (when the micro processor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan EM2E electronic manual, schematics and PWB's are only a mouse-click away.

ComPair consists of a Windows based fault finding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial or RS232 cable. In case of the EM2E chassis, the ComPair interface box and the television communicate with each other via a bi-directional service cable.

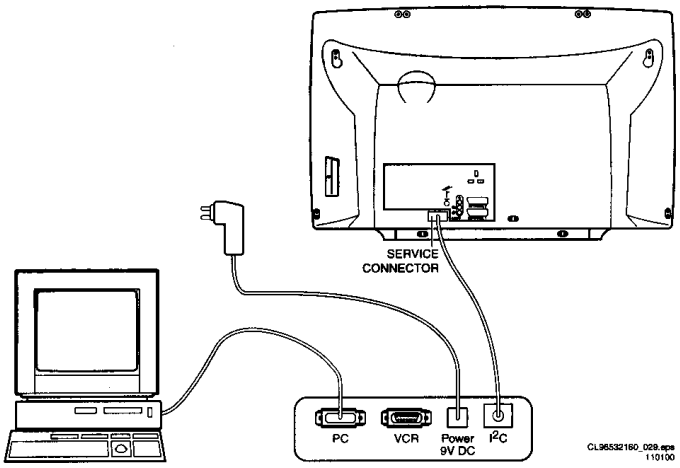


Figure 5-3

The ComPair fault finding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in 2 ways:
1. Communication to the television (automatic)
2. Asking questions to you (manually)

ComPair combines this information with the repair information in its database to find out how to repair the EM2E.

Automatic information gathering
Reading out the error buffer, ComPair can automatically read out the contents of the entire error buffer.
Diagnosis on I^2C level. ComPair can access the I^2C bus of the television without a physical connection. ComPair can send and receive infrared commands to the micro controller of the television. These commands are translated by the controller to I^2C commands and vice versa. In this way it is possible for ComPair to communicate (read and write) to devices on the I^2C busses of the EM2E.

Manual information gathering
Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the fault finding tree by asking you questions and showing you examples. You can answer by clicking on a link (e.g. text or an oscillogram) that will bring you to the next step in the faultfinding process.

A question could be: Does the screen give a picture? (Click on the correct answer) YES / NO
An example can be: Measure test point I7 and click on the correct oscillogram you see on the oscilloscope

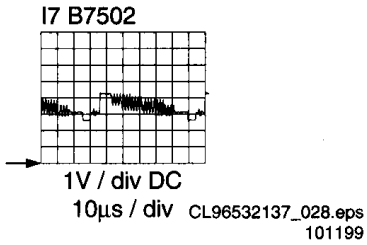


Figure 5-4

By a combination of automatic diagnostics and an interactive question/answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Additional features
Beside fault finding, ComPair provides some additional features like:

- Uploading/downloading of pre-sets
- Managing of pre-set lists
- Emulation of the Dealer Service Tool

5.4.2 SearchMan (electronic service manual)

When ComPair is installed in combination with SearchMan, all schematics and PWB's will be directly available while you repair a television if you click on a PWB or schematic link.
Example: Measure the DC voltage on C2568 (PWB/schematic) on the small signal level.
Clicking on PWB will automatically pop-up a picture of the PWB with the location of C2568 marked. Clicking on schematic will automatically pop-up the schematic with the location of C2568 marked.

5.4.3 Stepwise Start-up / Shutdown feature of set can be used via ComPair

Under normal circumstances, a fault in the power supply or an error during start-up will switch the television to protection-mode. ComPair can take over the initialisation of the television. In this way it is possible to distinguish which part of the start-up routine (hence which circuitry) is causing the problem.

Stepwise start-up explanation

Via ComPair the stepwise start-up can be realised. This is very helpful when a protection is activated (see also chapter 5.6).

State	Description mode	Display LED (Red)	Activate protection
0	Low Power Standby: 5V2/3V3 present, uP in Standby.	On	None
1	High Power Standby: TV-set in Standby.	Wait 1s, flash 1 time	None
2	Main Power On: 5V/ 8V present, HOP in Standby.	Wait 1s, flash 2 times	4, 5
3	HOP On: EHT startup, blackcurrent stabilisation off, picture blanked.	Wait 1s, flash 3 times	Plus 6, 2 & 1
4	Initialised. All IC's are initialised, blackcurrent stabilisation is on.	Wait 1s, flash 4 times	Plus rest
5	TV On: TV-set operates, unblanked picture.	Wait 1s, flash 5 times	

Stepwise shutdown explanation

In the stepwise shutdown mode, state 2 is skipped. (IC's can not be de-initialised).

State	Description mode	Display LED (Red)	De-activate protect.
5	TV On: TV-set operates, unblanked picture.	Wait 1s, flash 5 times	-
4	Initialised. All IC's stay initialised, blackcurrent stabilisation is on.	Wait 1s, flash 4 times	-
3	HOP On: EHT startup, blackcurrent stabilisation off, picture blanked.	Wait 1s, flash 3 time	6, 2, 1
1	High Power Standby: TV-set in Standby.	Wait 1s, flash 1 time	4, 5
0	Low Power Standby: 5V2/3V3 present, uP in Standby.	On	

Note: When set is in stepwise-mode and due to stepping-up a protection is activated, the set really will go into protection (blinking red led). The set will not leave the stepwise-mode however. By stepping up the set can be activated again, until state X, where protection was activated. At state (X-1) diagnostic measurements can be performed.

5.5 Error codes

5.5.1 Reading error codes from the error buffer

The error buffer can be read in 3 ways:

1. On the screen via the Service Alignment Mode (SAM). In case picture is OK, the error buffer can be read easiest via the SAM. In the main menu of the SAM the last 10 different error codes occurred are displayed. The most recent detected error code is displayed on the left side, so e.g.:
   - 0 0 0 0 0 means no error codes present in the buffer
   - 3 0 0 0 0 means one error code present in the buffer; error code 3
   - 2 3 0 0 0 means two error codes present in the buffer; error code 2 is the most recent, error code 3 is detected before 2.
2. Via the blinking LED procedure. The contents of the error buffer can also be made visible through the "blinking LED" procedure. This is especially useful when there is no picture. There are two methods:
   - When the SDM is entered, the LED will blink the number of times, equal to the value of the last (newest) error code (repeatedly).
   - Via the 'DIAGNOSE' key of the DST. If an error has been detected by the EM2E chassis, the set might go into protection. Without the presence of a picture, the errors can be displayed via the red LED on command of the DST, as long as the main-processor is still active. To display the errors via the red LED by the DST:
     1. Press the 'DIAGNOSE' key (in all modes except the SAM).
     2. Press '1' to view the last error detected (or '2', etc. to show the errors before).
     3. Press the 'OK' key. The blinking Red LED on the TV will now give the requested error.

        Example:
        Error code position 1 - 2 - 3 - 4 - 5
        Error buffer: 12 - 9 - 5 - 0 - 0

        After entering SDM: blink 1x long (750 ms for tens) - pause (1.5 s) - blink 8 x short (250 ms for units) - etc.
        After transmitting 'DIAGNOSE-2-OK' with the DST: blink 9 x short - pause (250 ms) - blink 9 x short - etc.
        After transmitting 'DIAGNOSE-3-OK' with the DST: blink 5 x short - pause (250 ms) - blink 5 x - etc.
        After transmitting 'DIAGNOSE-4-OK' with the DST: nothing happens
3. Via ComPair.

5.5.2 Clearing the error buffer

The error buffer can be cleared in 3 ways:

1. In the SAM by selecting the item 'RESET ERROR BUFFER' in the main menu.
2. By the 'DIAGNOSE 99' command of the DST (in all modes except the SAM). Press the DIAGNOSE key on the DST, followed by 9, 9 and then 'OK'.
3. Via ComPair.

Note: When error buffer is full (10 codes), no new error can be stored anymore. However of every error raised is monitored how long it exists in the error buffer. When for any reason a false raised error exists in the buffer, it will be deleted after 50 hours. If this error is still present after 50 hours, it will be raised again. In this way it is safeguarded that the error codes history is stored. Sometimes it is an option to first write down the error buffer content, reset the buffer, and look again which error codes are generated by the set.

5.5.3 Error code table

Error	Device	Description	Defective item	Diagram	Defect. module indication
1	ST24E32	NVM	7011	B5	Control
2	H fail protection	HFB			Horizontal Flyback
3	SAA4978	PICNIC	7709	B3	Feature Box
4	Supply 5 V	5V2			+5 V Supply
5	Supply 8 V	8V6			+8 V Supply
6	Slow I^2C-bus blocked				Slow I^2C blocked
7	TDA9330	HOP video control/geometry	7301	B4	Video Controller
8	TDA9320	HIP I/O-video processing	7323	B2	Chroma IF IO
9	X-ray protection			A3	
11	HOP protection				
12	Tuner protection	TUNER_PROT			+8 V (Tuner) Supply
13	UV1316	Tuner	U1200	A7	Tuner
14	MSP3451/3415	ITT sound processor + Dolby	7651	B6	Audio Module
15	Flash protection				
16	Featurebox protection	FBX_PROT			

Remark:If on the DST the text 'ERROR 2' is displayed, this means that the communication from the TV to the DST has failed.

5.6 Protections

5.6.1 General

The EM2E has only one micro-processor (OTC) which remains active during Standby. This because power of the microprocessor and the attached memory chip set is coming from the 3V3 supply, which is derived from the 5V Standby-circuitry. So in both Power-on as in Standby-mode the microprocessor is connected to this power supply.

If a fault situation is detected an error code will be generated and if necessary the set will be put in the protection-mode. The protection-mode is indicated by blinking of the red LED at a frequency of 3 Hz. In some error cases the micro processor does not put the set in the protection-mode. The error codes of the error buffer can be read via the service-menu (SAM), the blinking LED procedure or via DST/ComPair. The DST diagnose functionality will force the set into the Service-standby, which is alike the usual Standby, however the micro-processor has to remain in normal operation completely.

To get a quick diagnosis the EM2E has 3 service-modes implemented:

- The Customer Service Mode (CSM).
- The Service Default Mode (SDM). Start-up of the set in a predefined way.
- The Service Alignment Mode (SAM). In this mode items of the set can be adjusted via a menu and with the help of test patterns.

Both SDM & SAM modes can be entered via the 'service pads' on the SSB, via a RC (DST or standard RC) or via ComPair. The SAM can not be entered in Standby, the set has to be in normal operation.

The EM2E 'Protection Diagram' shows the structure of the protection system. See diagram below.

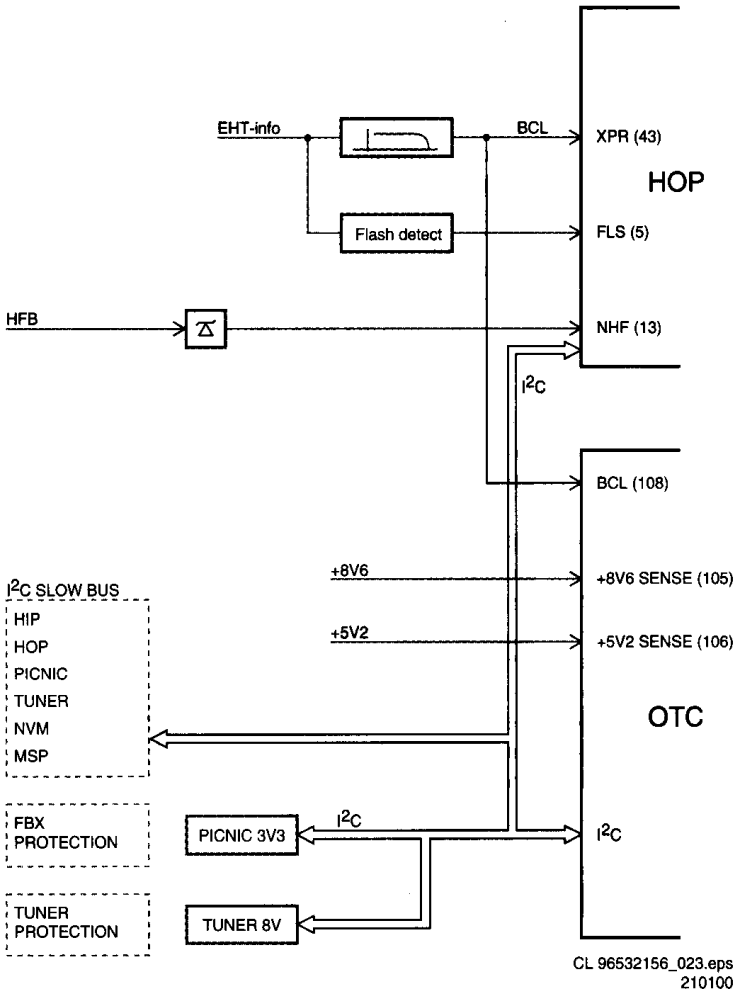


Figure 5-5

There are several types of protections:

- I^2C related protections
- OTC related protections (via polling on I/O pins or via algorithms).
- HOP related protections (mainly for deflection items).
- Hardware errors which are not sensed by the OTC (e.g. BRIDGE_PROT)

I^2C related protections

In normal operation some registers of the I^2C controlled IC's will be refreshed every 200 msec. During this sequence the I^2C-busses and the I^2C -IC's as well will be checked. The I^2C

protection will take place if the SDA and SCL are whether short circuited to ground or to each other. An I^2C error can also occur, if the power supply of the IC is missing (e.g. TUNER_PROT (error 12) & FBX_PROT (error 16)).

OTC related protections

If a protection is detected at an input of the OTC, all protection inputs of the OTC will be scanned every 200 msec. for 5 times. If the protection on one of the inputs is still activated after 1 sec., then the set will be put in the protection-mode. Before the scanning is started a so-called ESD-refresh will be carried out first, because the interrupt on one of the inputs may be caused either by a FLASH or by ESD. As a FLASH or ESD can harm the settings of some IC's, the HOP-HIP-MSP-PICNIC-NVM and Tuner are initialised again to ensure the normal picture and sound conditions of the set.

- 8.6 V and 5.2 V protection. The presence of the 8.6 V and 5.2 V is sensed by the OTC. If these voltages are not present, then an error code is stored in the error buffer of the NVM, and the set is put in the protection-mode.

HOP related protections

Every 200 msec. the status register of the HOP is read by the OTC via I^2C. If a protection signal is detected on one of the inputs of the HOP, then the relevant error bit in the HOP register is set to 'high'. If the error bit is still 'high' after 1 sec., the OTC will store the error code in the error buffer (NVM) and depending on the relevancy of the error bit the set will either go into the protection-mode or not.

- HFB: Horizontal Flyback. If the horizontal flyback is not present, then this is detected via the HOP (HFB_X-RAY_PROT). One status bit is set to 'high'. The error code is stored in the error buffer and the set will go into the protection mode
- Flash detection. From the EHT-info, via D6303 and T7303 a flash will stop the H-drive and line output stage immediately. The FLS-bit in the status register of the HOP is set to 'high'. As the duration of a flash is very short the FLS-bit will be reset to 'low' again after the flash refresh, so via a slow start the set will be started again.

Hardware related protections

Due to the architecture (with 'hot' deflection) there are two protections that are 'unknown' to the microprocessor, namely the 'BRIDGE_PROT' from the line-stage and the 'NO_VFB' protection form the frame-stage. If one of these protections is triggered, the set is positioned in 'Standby'-mode. The OTC will now try to re-start the set. If this will not succeed after 5 times (after ≈ 1 minute), the OTC will generate error 15 (Flash protection) and will start the blinking red LED.

5.7 Repair tips

5.7.1 General

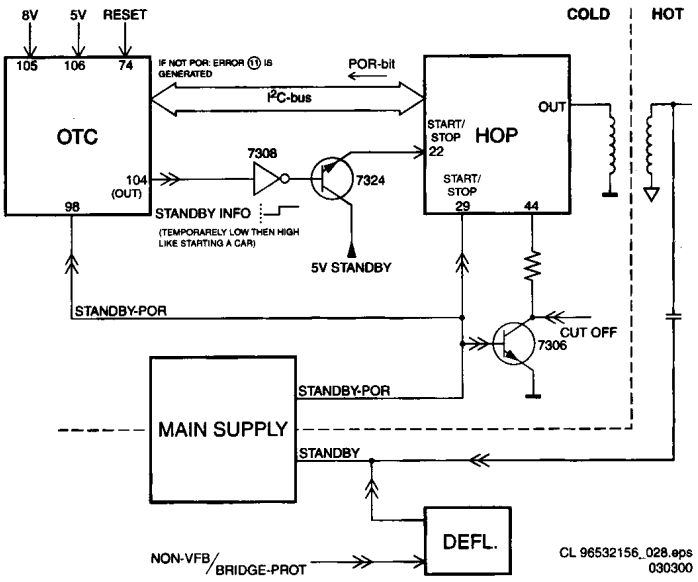


Figure 5-6

The start-up of the set is very different as of other sets:

1. When the set is switched 'ON', first the HOP is placed in 'low power start-up' mode (HOP-standby-mode). This means that 5 V (derived from available Standby-supply) is connected to pin 22 of the HOP-IC.
2. Now the HOP is driving the line-circuitry with 50 kHz pulses. At the base of the line-transistor this is sensed via the 'STANDBY'-line.
3. This signal triggers the Main supply to operate. Now the line-stage has 'BAT'-voltage (141 V), it will also start.
4. After the 5 and 8 V-supply lines are sensed by the OTC, it will read the POR-bit from the HOP via the I^2C-bus.
5. Now the HOP is switched in 'ON'-mode and the set will start-up further with normal drive (31.25 kHz for PAL).
6. The last step will be the unblanking of the picture.

SO STANDBY IS NOT CONTROLLED VIA A STANDBY-LINE FROM MICROPROCESSOR, BUT IS ACHIEVED INDIRECTLY VIA THE HOP-CIRCUITRY.

Notice that a very big part of the set (Large Signal Panel) is 'hot', meaning the primary part of the Standby supply, the whole Main supply (except for the secondary Audio supply) and the complete deflection circuit. SO NOTICE THAT THE DEFLECTION-COIL IS HOT!

This set does not have an IR transmitting-LED anymore. In its place, a Service (ComPair) connector is implemented at the rear of the set, which is directly accessible. In addition to this, there is a blinking LED procedure to show the contents of the error buffer.

The relay you hear during switching 'ON' (via the main switch) is from the degaussing-circuitry. So it is not used for switching the supply as in the MG-chassis.

When using ComPair (connect cable to ComPair-connector at the rear of the set, placed behind a separate cover), there exists the possibility to have a stepwise start-up procedure. With this mode one can startup the set step-by-step. This also means that in certain steps some protections will not be activated. This can sometimes be convenient during repair. See table in 5.4.3, which is describing the stepwise start-up mode with belonging LED behaviour.

On the SSB there are 'service pads' implemented to activate (via bridging) the SDM- or SAM-mode (see chapter 4). When the SDM-mode is activated, the processor-controlled protections (so not the Hardware and HOP-protections) can be overruled. This means that the ADC-input protections (5- and 8 V) and the I^2C not-acknowledging info from Tuner and FBX can be overruled.
WHEN DOING SO THE SERVICE-ENGINEER MUST KNOW WHAT HE IS DOING, AS IT COULD LEAD TO DAMAGING THE SET.

'Repair-tips how to repair the Main power supply:

- Simplest way is to replace components of the Main supply with repair kit (3122 785 90100)
- More detailed way:
  - Replace FET 7504 and zener 6505
  - Remove SSB-panel
  - Short-circuit BE of TS7529 in order to put supply in 'on'-mode (TS7529 is blocking then)
  - Load capacitor C2515 (V_{BAT}) with a load of 500 ohm. Supply can not work without a minimum load.
  - Use a variac to slowly increase the V_{MAINS}. Measure over sensing-resistors R3514/15 whether a nice sawtooth-voltage becomes available. Also measure the V_{BAT}-output
  - V_{BAT} may never exceed 141 V. If so there is something wrong in the feedback-circuitry (e.g. regulator 7506)

Repair-tips how to repair the Standby power supply:

- Simplest way is to replace components of the Standby supply with repair kit (3122 785 90110)

Repair-tips how to repair the Deflection-circuitry:

- Simplest way is to replace components of the Deflection-circuitry with repair kit (3122 785 90120)

Service-tips:

- Be careful measuring on gate of FET 7504. Circuitry is very high ohmic and can easily be damaged.
- Take care not to touch 'hot' heatsink while disconnecting SSB, despite the fact that mains cord is out of mains socket. There still is an annoying rest-voltage for a short while.
- Do not try to measure on side of SSB directed to the hot heatsink. This is dangerous. All service test points are guided to the Tuner side and are pointed out by service printing. Where the circuitry was too crowded to place this service-printing it has been explained on the Test point overviews in this manual

5.7.2 Repair tips

Phenomenon	Possible Cause	Repair-tip
No picture, no LED.	Standby Supply defective.	Measure circuitry (see diagram A2). Start at testpoint P16. Regardless the mode of the set, this voltage should always be available.
No picture, red LED (high intensity) despite expectation the set should be 'on' (this looks like Standby).	There are 2 protections that are not 'seen' by processor, that force set in 'Standby'-mode, namely 'NO-VFB-prot' (= no frame-deflection), or 'BRIDGE_PROT' (safety error).	If protection is activated by 'NO_VFB-prot', this can be measured with a scope on service test point F10 (diagram A4). Before this protection is activated, a few seconds a horizontal white line is visible. The 'BRIDGE_PROT' error may never occur. Is implemented due to legal requirements. Flash protection error (15) will be generated in both cases after 5 restart attempts. Visible via blinking LED procedure. NO_VFB-prot can be determinated by white line.
No picture, red LED blinking (3 Hz).	Set is in protection due to various causes. For error codes see error-code list.	You have no picture, so: - or you read out error buffer via ComPair - or you read out blinking LED information via 'diagnose' x dealer remote - or you read out blinking LED sequence via <default>-button dealer remote - or you read out blinking LED sequence via service default mode entered via RC-command 062596 + 'menu' When error is known, check circuitry related to supply-voltage and I^2C-communication.
No picture, red LED blinking code 6,6,6 or 1,1,1	No communication on I^2C-bus or NVM-I^2C-bus to processor. Set is in protection-mode	As processor cannot communicate with one of the 2 busses it spontaneously starts blinking. Measure dependent of the error on the I^2C-bus which device is loading the bus. This protection can be overruled via SDM-entry on SSB or via stepwise start-up mode step 'MainPowerOn'.
No picture, no sound, set is making audible squeaking sound	Supply could be in hiccup-mode which can be heard via supply-transformer squeaking	This could be caused by: - Short-circuited V_{BAT} (caused by short circuited line transistor 7421) or - Short-circuited sound-winding (amplifier is short-circuiting 28 V) or - Short-circuited D6514 (due to a too high V_{BAT}). Delete excessive load to see where failure is caused by or check feed back circuit. See repair-tip main power supply (supply needs a minimal load).
No picture, no sound, LED works fine	Supply does not work correctly	If e.g. V_{BAT} is only about 90 V, regulator-IC 7506 could be damaged.
No RC5-reception. Red LED does not echo RC-commands.	Processor-circuitry or RC-receiver is wrong.	In case set reacts on local keyboard operation, error must be found in the IR-receiver circuitry (diagram E).
Relay-activation (degaussing) not audible when switch set 'on' from 'off'.	Processor not working correctly.	Check RESET-circuitry on diagram B5. When switching on the set all i/o-pins of processor should become high for a moment, so also the degauss-input signal.
No sound, but picture.	Measure P7 on diagram A1. Possible sound-amplifier is broken (but not short-circuited), or sound-enable line is high (see diagram A5). Further the audio-signal path must be measured (HIP, MSP, switch-IC's, amplifier).	Measure and repair. With ComPair there is a beep-test that can determine where the signal stops (use loudspeakers, headphone).
No sound at headphone output.	Discrete amplifiers or supply to it could be damaged.	Measure A12, A13, A14, A15 and supply-line on diagram A6.
Picture is rotated.	Rotation-circuitry or supply to it could be damaged.	Measure test points F3, R1, R2 on diagram A4.
No picture.	Check functionality and cabling Tuner to SSB.	Notice cable 0946.
Picture looks like cushion, further O.K.	Or NVM-content is overwritten or E/W-MOSFET is short-circuited	First check in Service Alignment Mode, whether geometry can be restored. If not check testpoint L4 and diagram A3, or measure with an ohm-meter whether TS7480 is defective.
Very white picture, with flyback lines visible	180 V is missing on CRT-panel	Probably R3468 on LSP (diagram A3) is interrupted, or bad connection plug 0324 to 0224 (CRT-panel).
Un-sharp picture	Focus could be mis-aligned or SCAVEM-circuitry does not work correctly	Align focus-potmeter of Line Transformer; check SCAVEM-circuitry on CRT-panel [F].
Un-synced picture	Sync is derived in HIP-IC from X-tals 1305 and/or 1308	Maybe a X-tal is making bad contact.
Picture distorted.	Check video-path, service default mode.	Investigate whether there exist an error code in the error buffer. In case there is an error code, check I^2C-bus and/or supply-lines (see overview supply-lines). Measure and check signal path Tuner, HIP, PICNIC, HOP, RGB-amplifier. In case it is a geometry-issue, check Frame-circuitry, alignments or possible corrupted NVM (7011)
No menu, OSD.	Probably processor is defective.	Measure test points C7, C8, C9, C10 on diagram B5.

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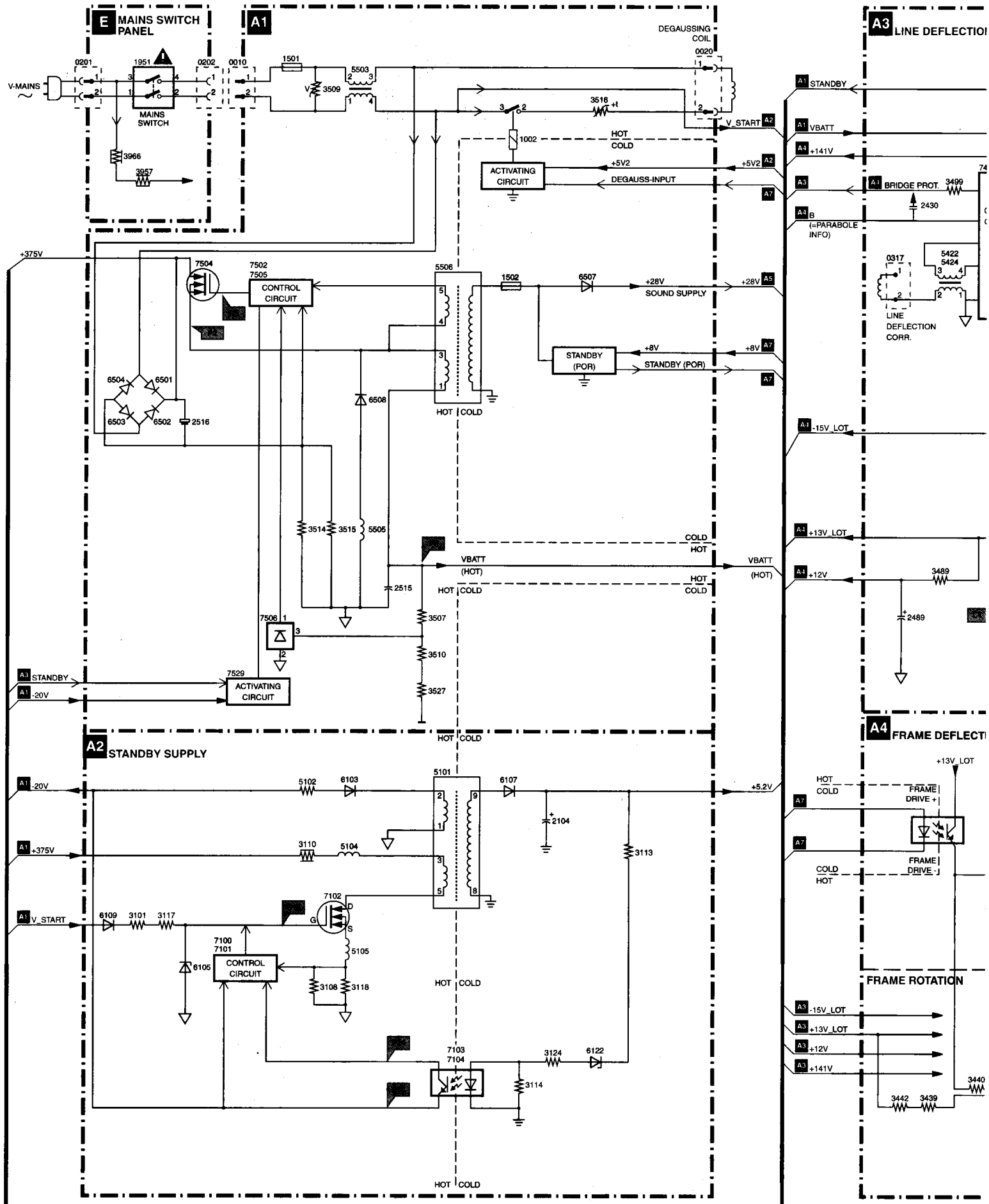
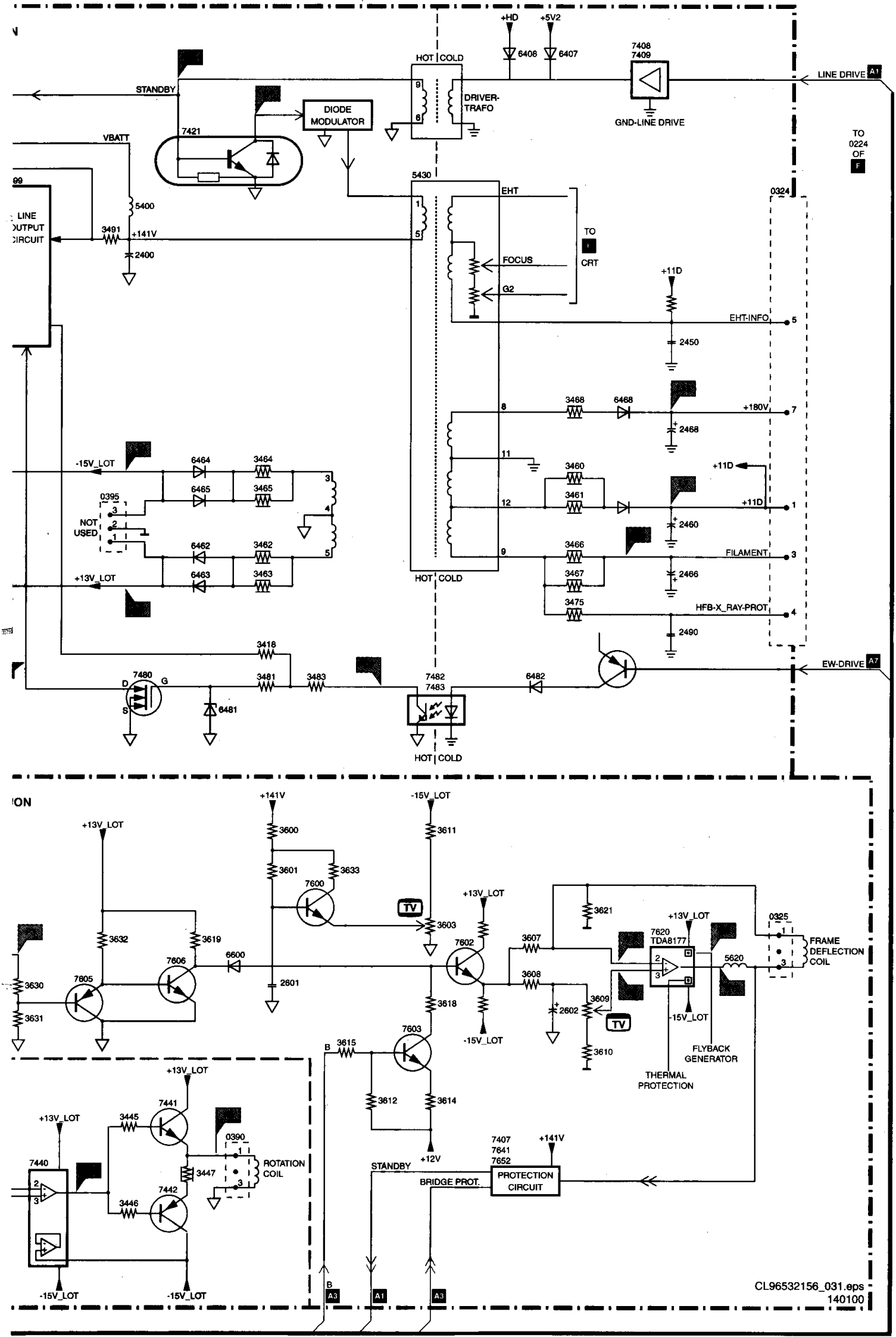
090200

6. Wiring diagram, blockdiagram, supply diagram and testpoints

Blockdiagram




+HD
+5V2
6408
6407
7408
7409
LINE DRIVE
A1
HOT
COLD
STANDBY
DIODE MODULATOR
DRIVER-TRAFO
GND-LINE DRIVE
TO 0224 OF F
VBATT
7421
5430
EHT
FOCUS
G2
TO CRT
0324
LINE OUTPUT CIRCUIT
5400
3491
+141V
2400
+11D
EHT-INFO
2450
3468
6468
+180V
2468
-15V_LOT
6464
6465
3464
3465
0395
NOT USED
6462
6463
3462
3463
+13V_LOT
3460
3461
+11D
2460
3466
3467
FILAMENT
2466
3475
HFB-X_RAY-PROT
2490
3418
7480
3481
3483
7482
7483
6482
6481
EW-DRIVE
A7
ION
+141V
-15V_LOT
+13V_LOT
3600
3611
3601
3633
7600
TV
3603
3632
3619
7606
6600
7605
3630
3631
2601
7602
3618
3607
3608
3621
7620
TDA8177
0325
FRAME DEFLECTION COIL
5620
3609
2602
3610
-15V_LOT
FLYBACK GENERATOR
THERMAL PROTECTION
7603
B
3615
3612
3614
+12V
7441
3445
0390
ROTATION COIL
7440
3447
7442
3446
STANDBY
BRIDGE PROT.
7407
7641
7652
PROTECTION CIRCUIT
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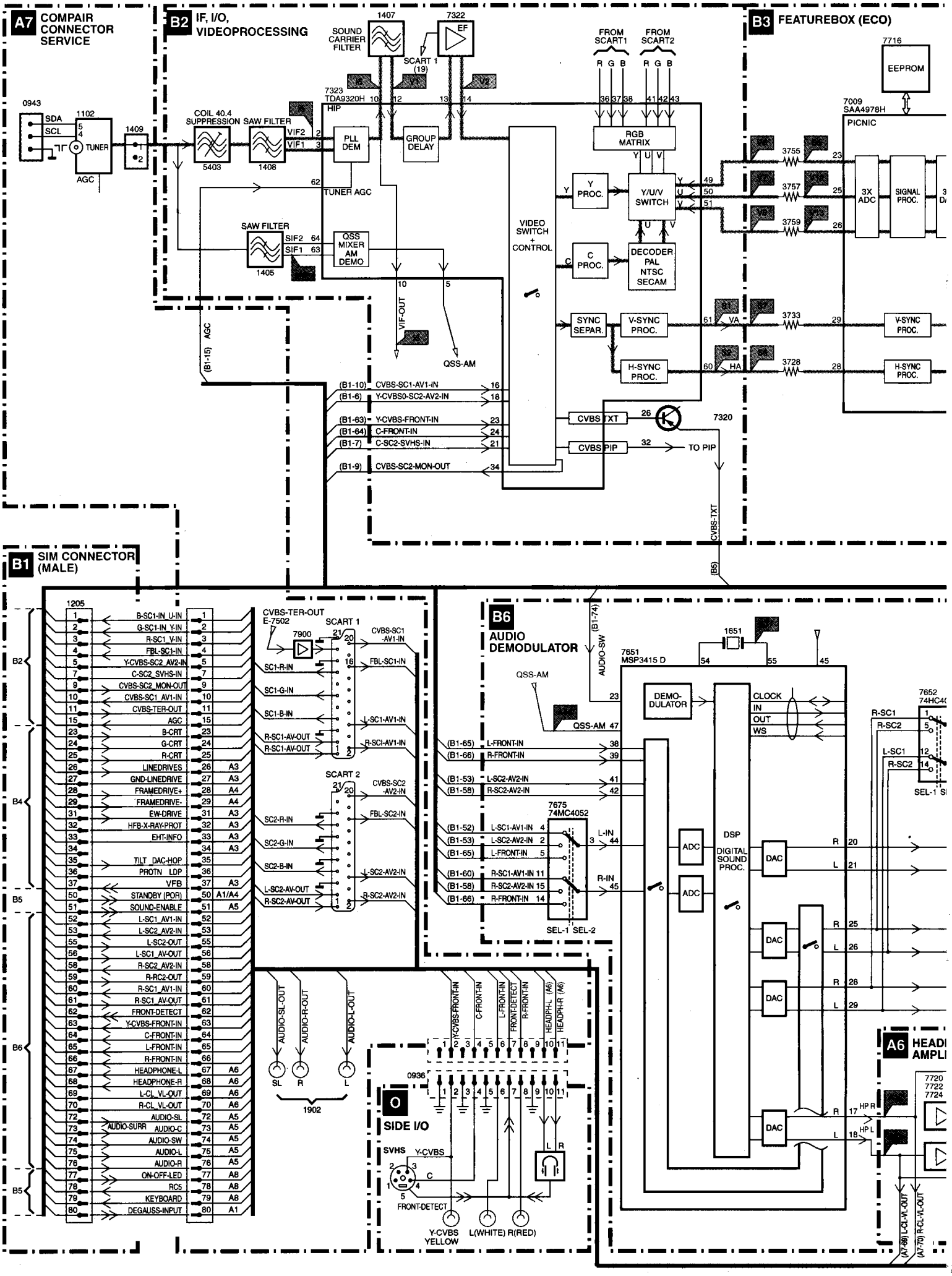
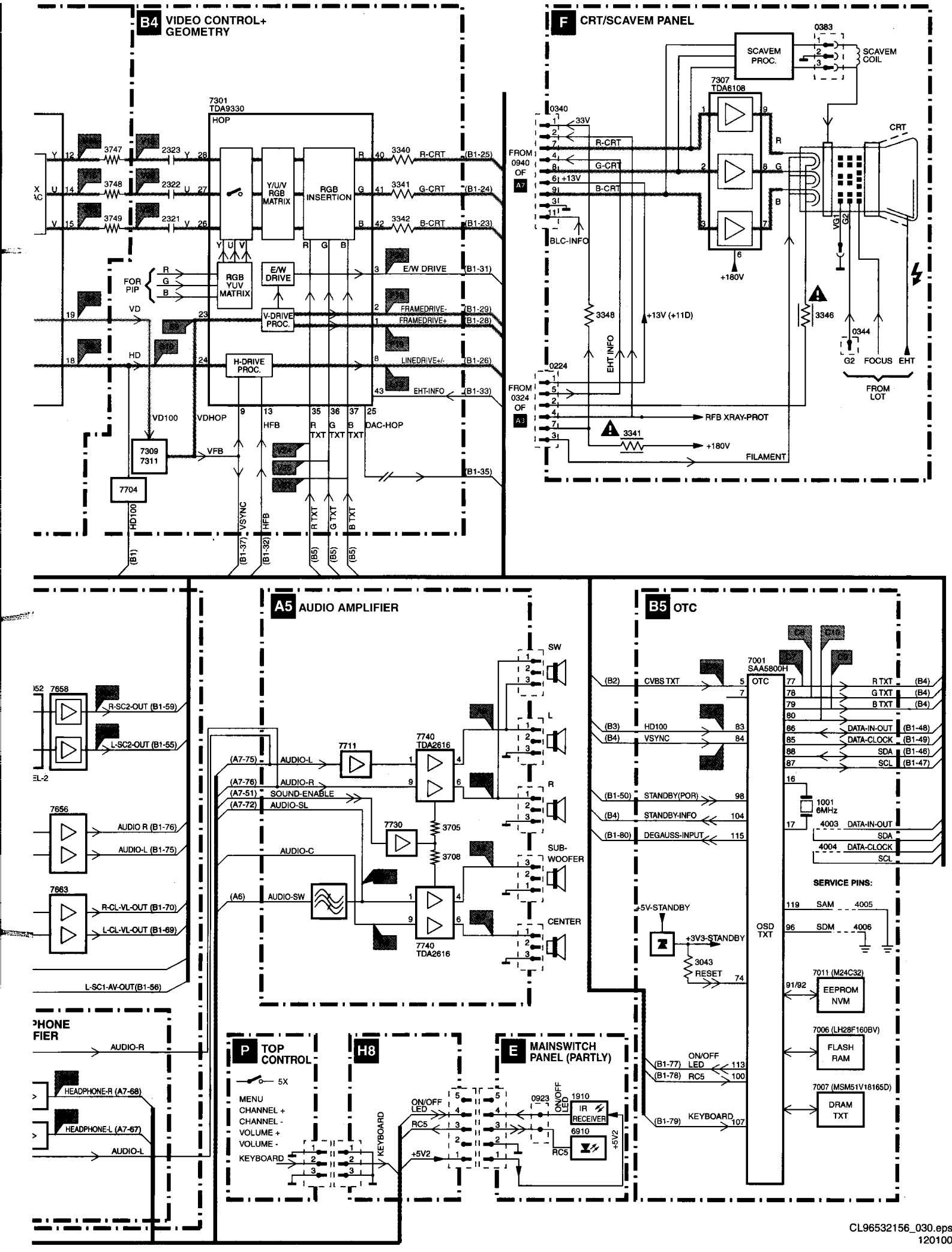
140100

Blockdiagram





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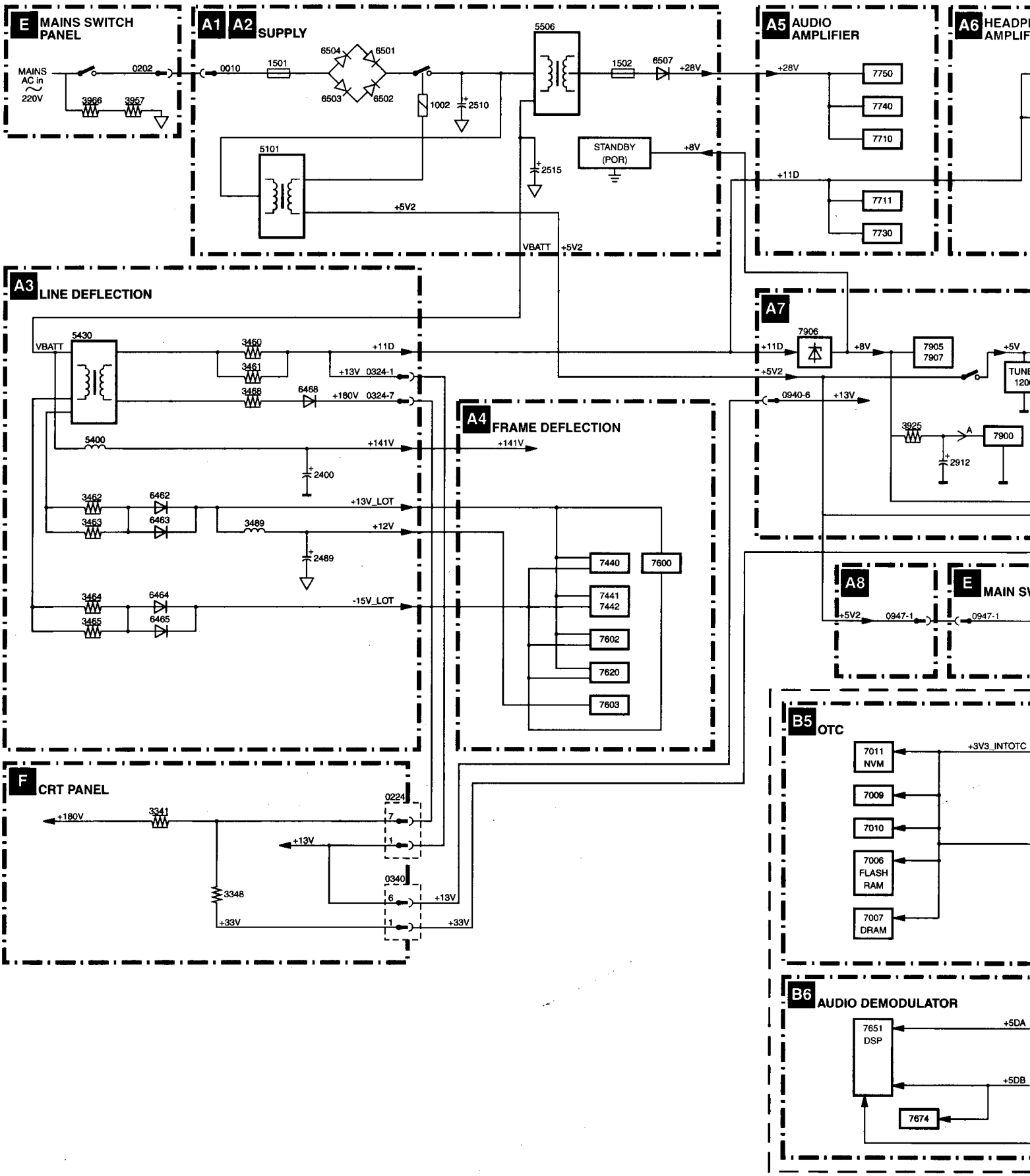
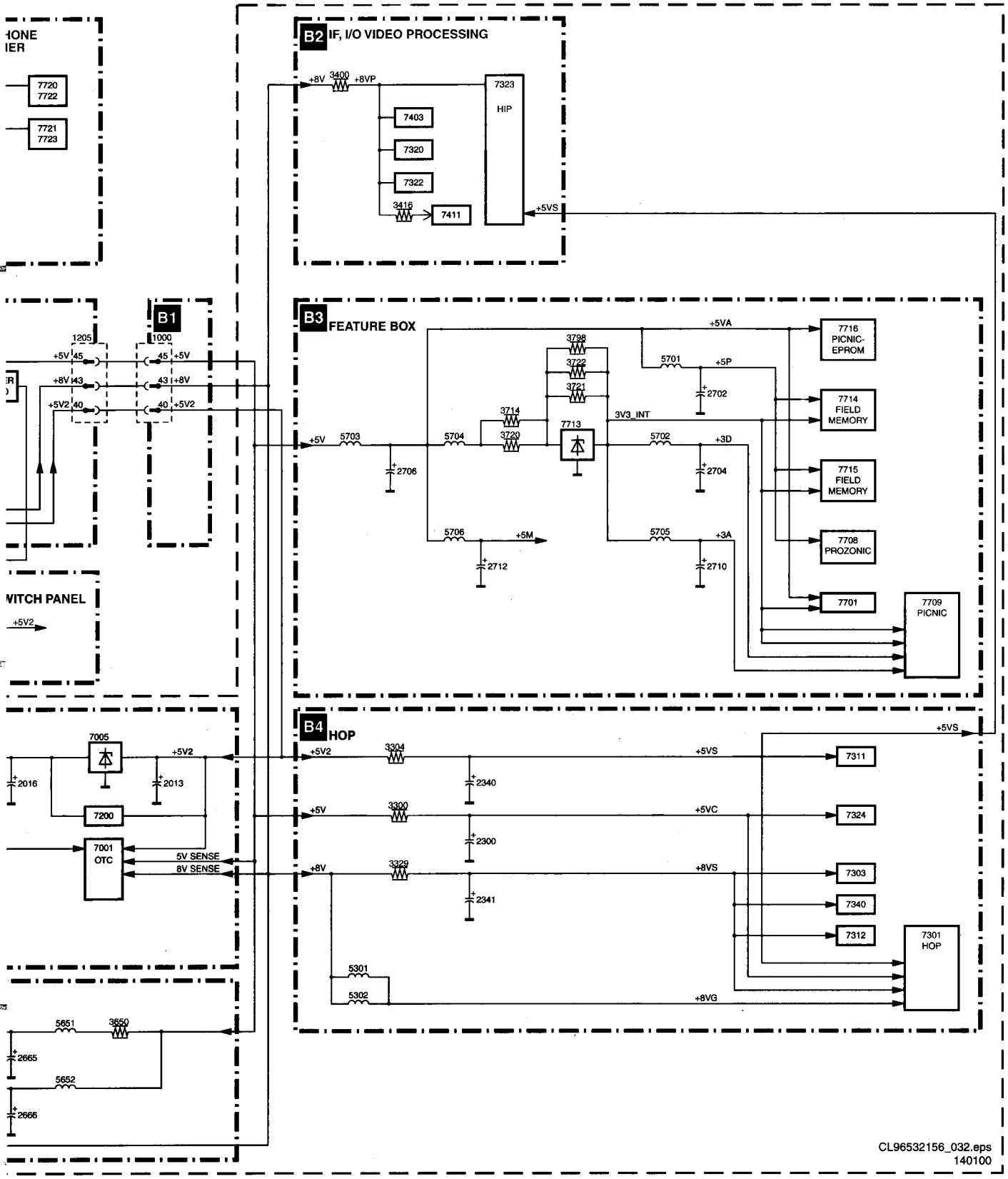
120100

Supply lines overview




HONE
IER
7720
7722
7721
7723
B2 IF, I/O VIDEO PROCESSING
+8V
3400
+8VP
7323
HIP
7403
7320
7322
3416
7411
+5VS
B1
1205
1000
+5V
45
+8V
43
+5V2
40
B3 FEATURE BOX
+5VA
7716
PICNIC-
EPROM
3798
3722
3721
5701
+5P
2702
7714
FIELD
MEMORY
3714
3720
7713
3V3_INT
+5V
5703
5704
2706
5702
+3D
2704
7715
FIELD
MEMORY
5706
+5M
2712
5705
+3A
2710
7708
PROZONIC
7701
7709
PICNIC
WITCH PANEL
+5V2
B4 HOP
+5VS
7005
+5V2
2016
2013
7200
7001
OTC
5V SENSE
8V SENSE
3304
2340
7311
+5V
3300
+5VC
2300
7324
+8V
3329
+8VS
2341
7303
7340
7312
7301
HOP
5301
5302
+8VG
5651
3650
2665
5652
2666
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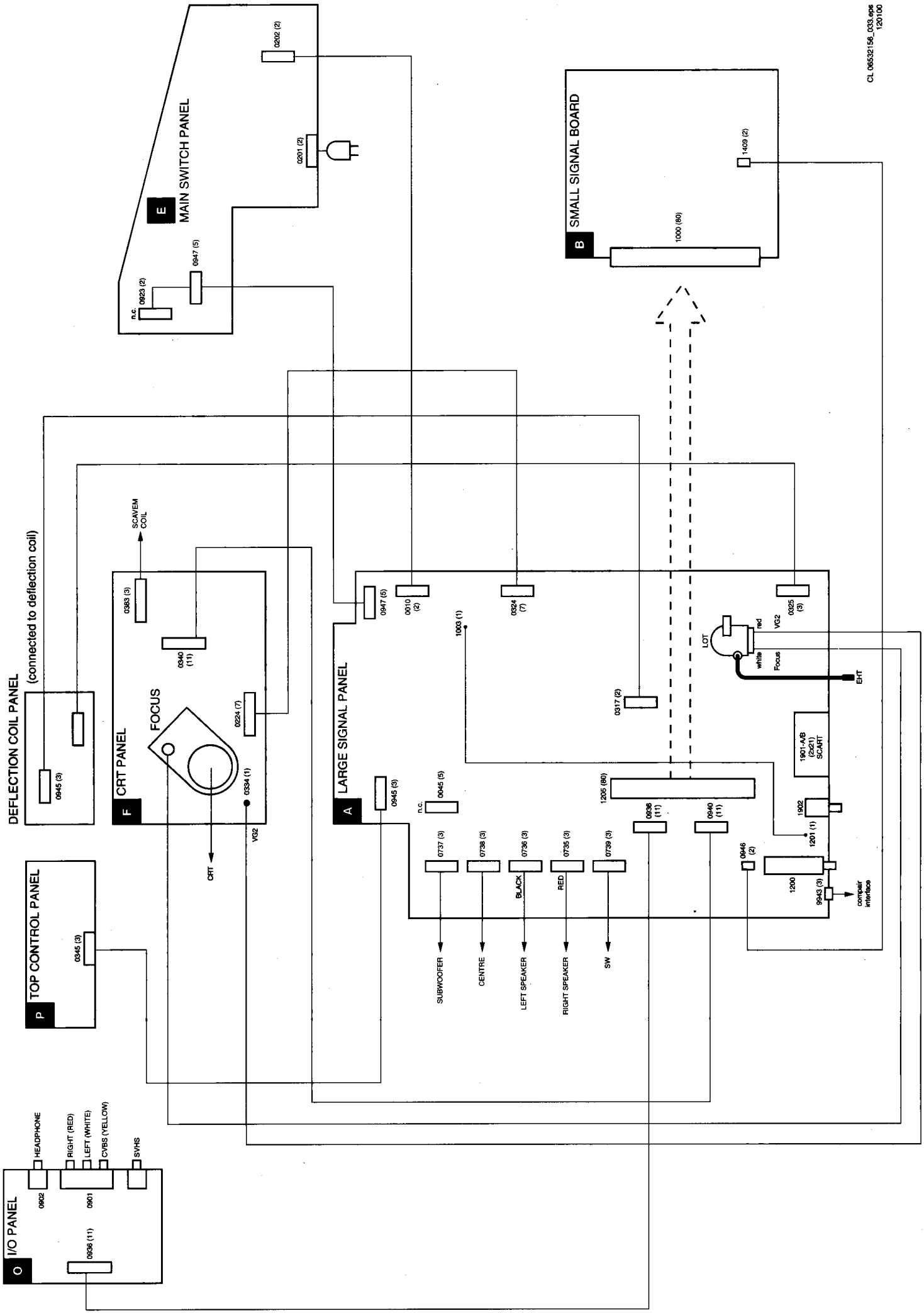
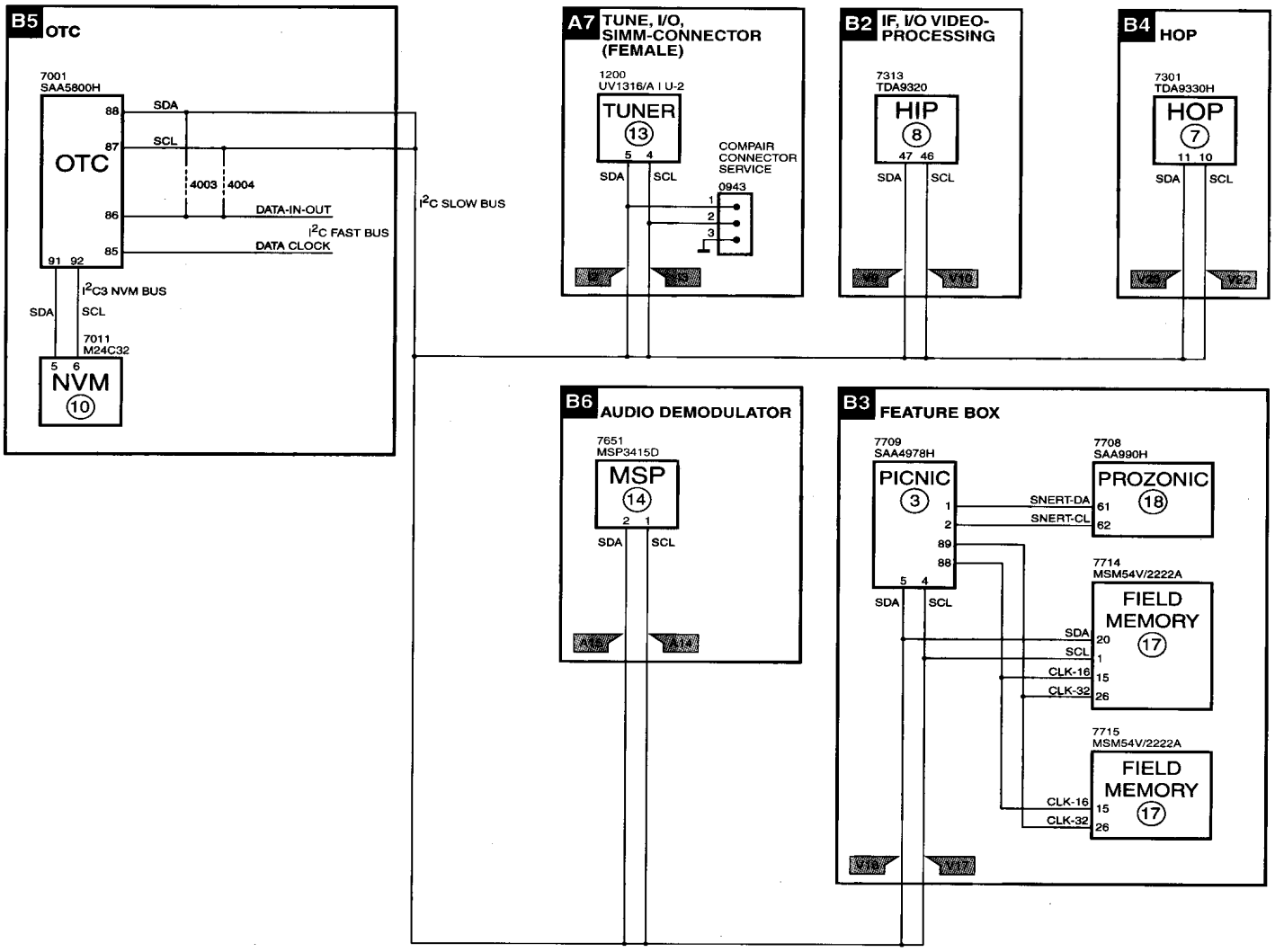
140100

I2C bus


CL 06532156_033.eps 120100
E MAIN SWITCH PANEL
0202 (2)
0201 (2)
0947 (5)
n.c.
0923 (2)
B SMALL SIGNAL BOARD
1409 (2)
1000 (80)
DEFLECTION COIL PANEL
(connected to deflection coil)
0945 (3)
F CRT PANEL
FOCUS
SCAVEM COIL
0383 (3)
0340 (11)
0224 (7)
0334 (1)
VG2
CRT
A LARGE SIGNAL PANEL
0945 (3)
0947 (5)
0010 (2)
0324 (7)
1003 (1)
0317 (2)
0325 (3)
LOT
red
VG2
white
Focus
EHT
1901-A/B (2x21) SCART
1205 (80)
n.c.
0045 (5)
0936 (11)
0940 (11)
1902
1201 (1)
0737 (3)
0738 (3)
0736 (3)
0735 (3)
0739 (3)
BLACK
RED
0946 (2)
1200
9943 (3)
compair interface
SUBWOOFER
CENTRE
LEFT SPEAKER
RIGHT SPEAKER
SW
P TOP CONTROL PANEL
0345 (3)
O I/O PANEL
HEADPHONE
RIGHT (RED)
LEFT (WHITE)
CVBS (YELLOW)
SVHS
0902
0901
0936 (11)

I2C overview



Error	Device	Description	Defective item	Diagram	Defect. module indication
1	Beam Current protection	BC-PROT			Beam Current
2	H fail protection	HFB			Horizontal Flyback
3	SAA4978	PICNIC	7709	B3	Feature Box
4	Supply 5V	5V2			+5V Supply
5	Supply 5V	8V6			+8V Supply
6	Slow I2C-bus blocked				Slow I2C blocked
7	TDA9330	HOP video control/geometry	7301	B4	Video Controller
8	TDA9320	HIP I/O-video processing	7323	B2	Chroma IF IO
9	X-ray protection			A3	
10	ST24E32	NVM	7011	B5	Control
11	HOP protection				
12	Tuner protection	TUNER_prot			+8V (Tuner) Supply
13	UV1316	Tuner	U1200	A7	Tuner
14	MSP3451/3415	ITT sound processor + Dolby	7651	B6	Audio Module
15	Flash protection				
16	Featurebox protection	FBX_PROT			
17	SAA4956	DNR-memory	7714	B3	
18	SAA4990	PROZONIC	7708	B3	

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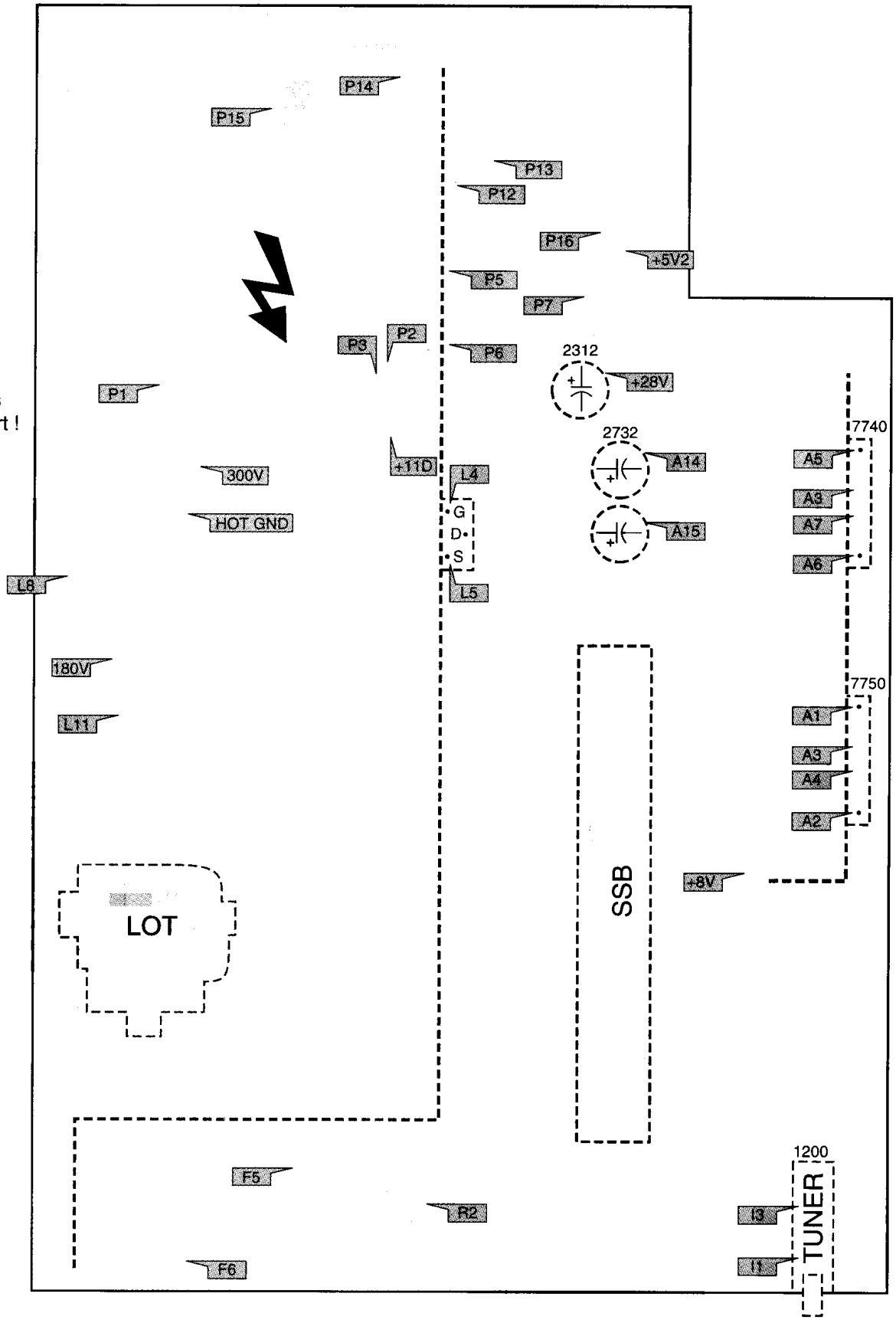
140100

Testpoint overview LSP panel

Large Signal panel (LSP) (copper side)

Warning

All alignments are on hot-part !



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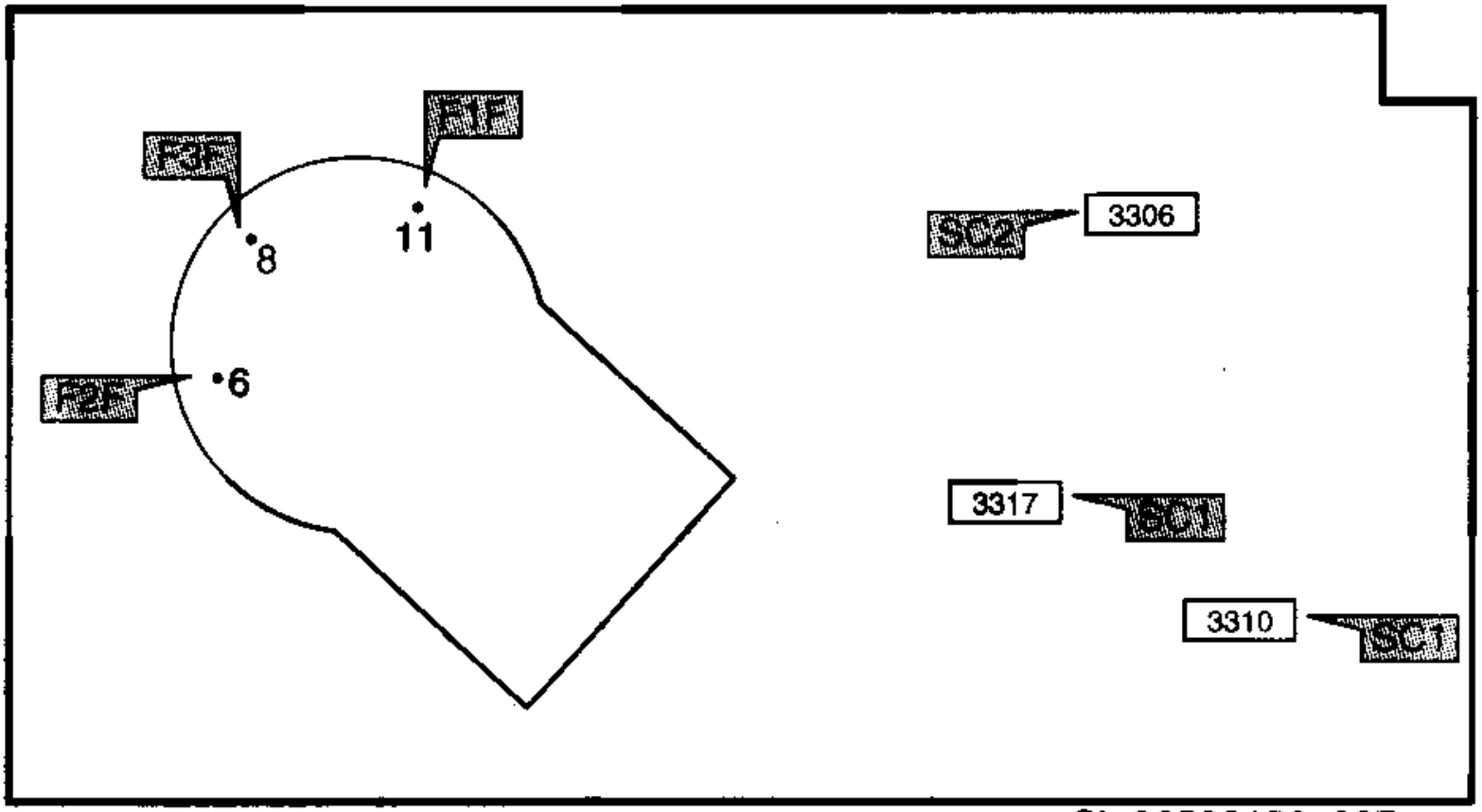
280200

Testpoint overview CRT panel



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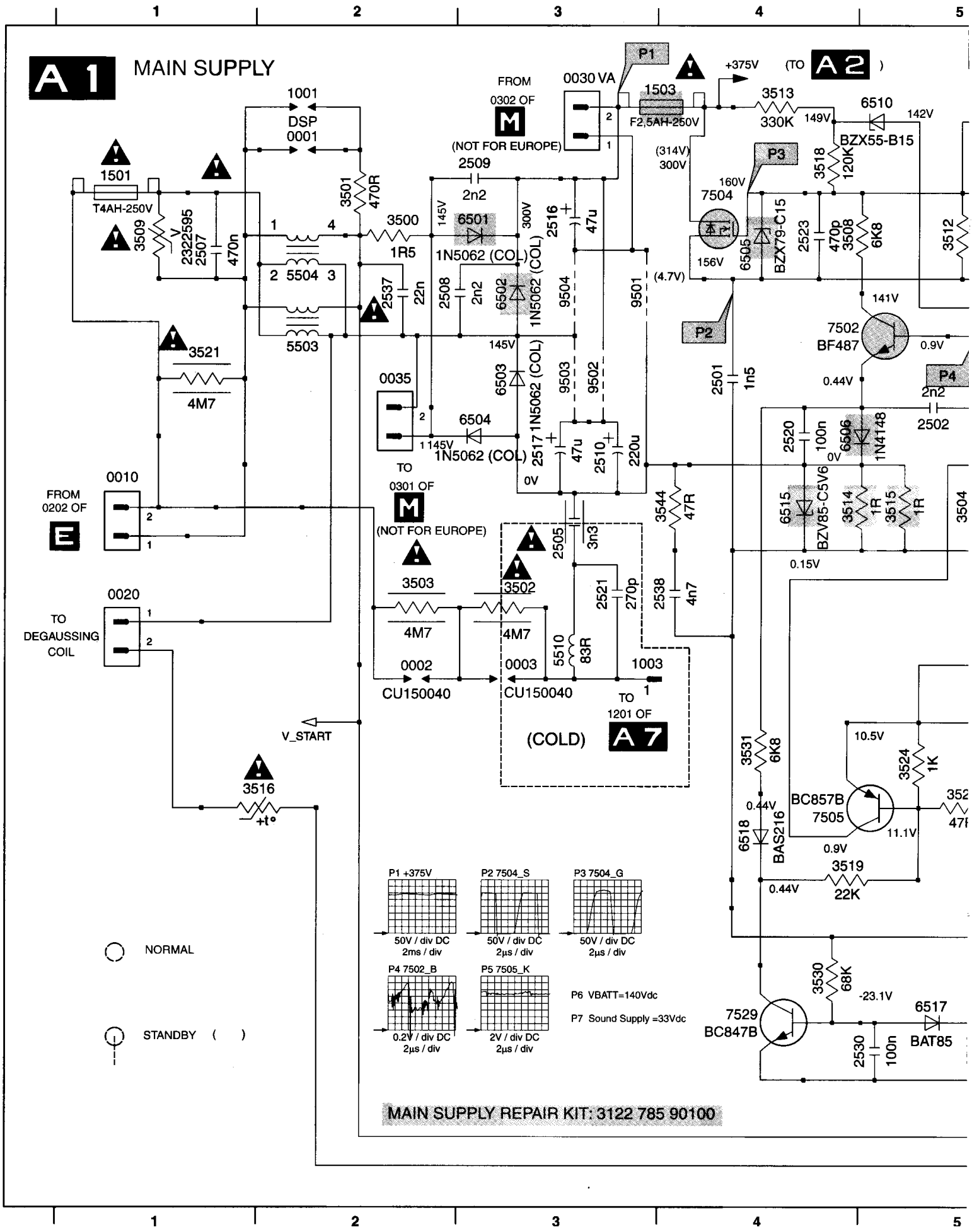
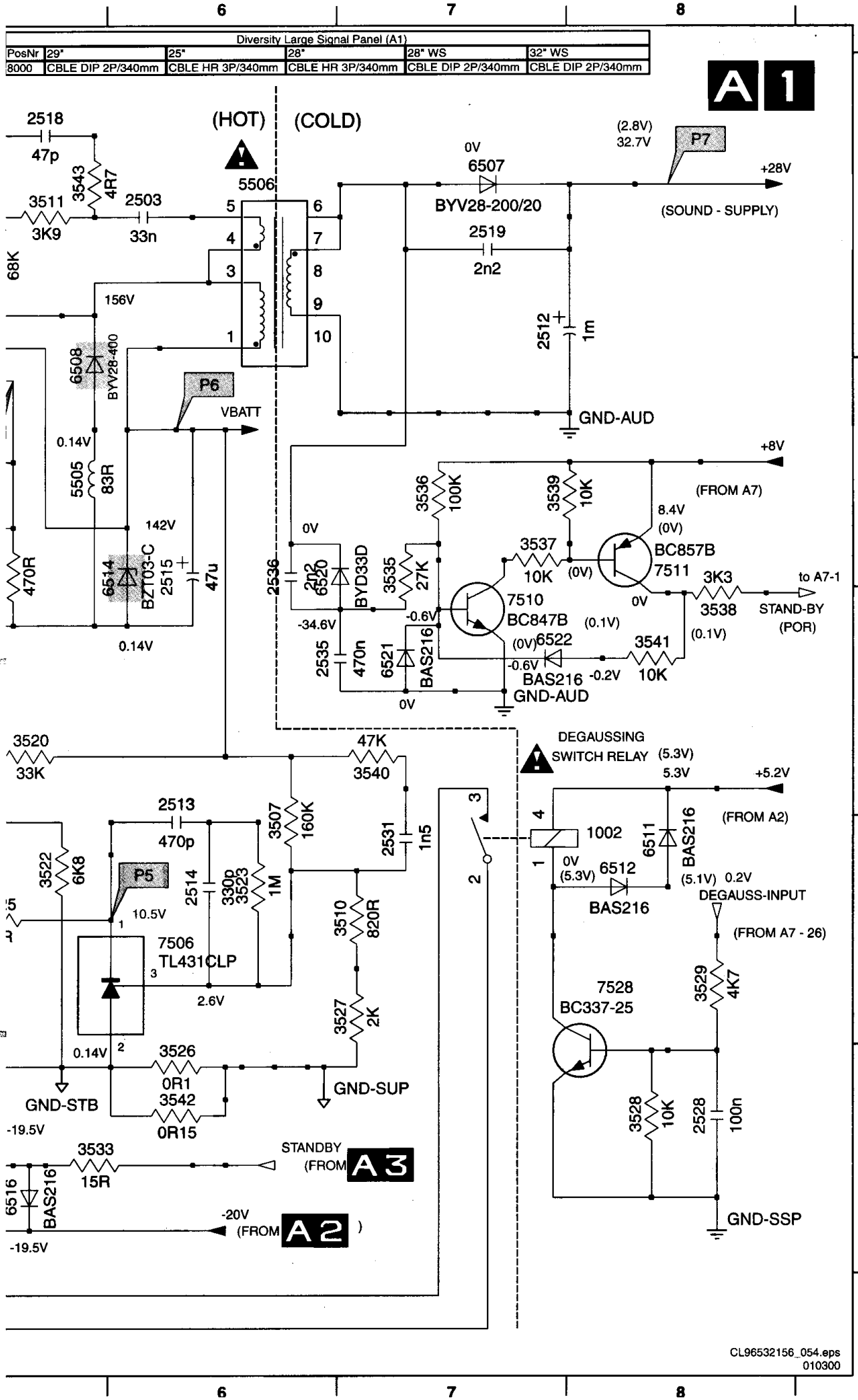
280200

7. Schematics and PWB's

Main supply

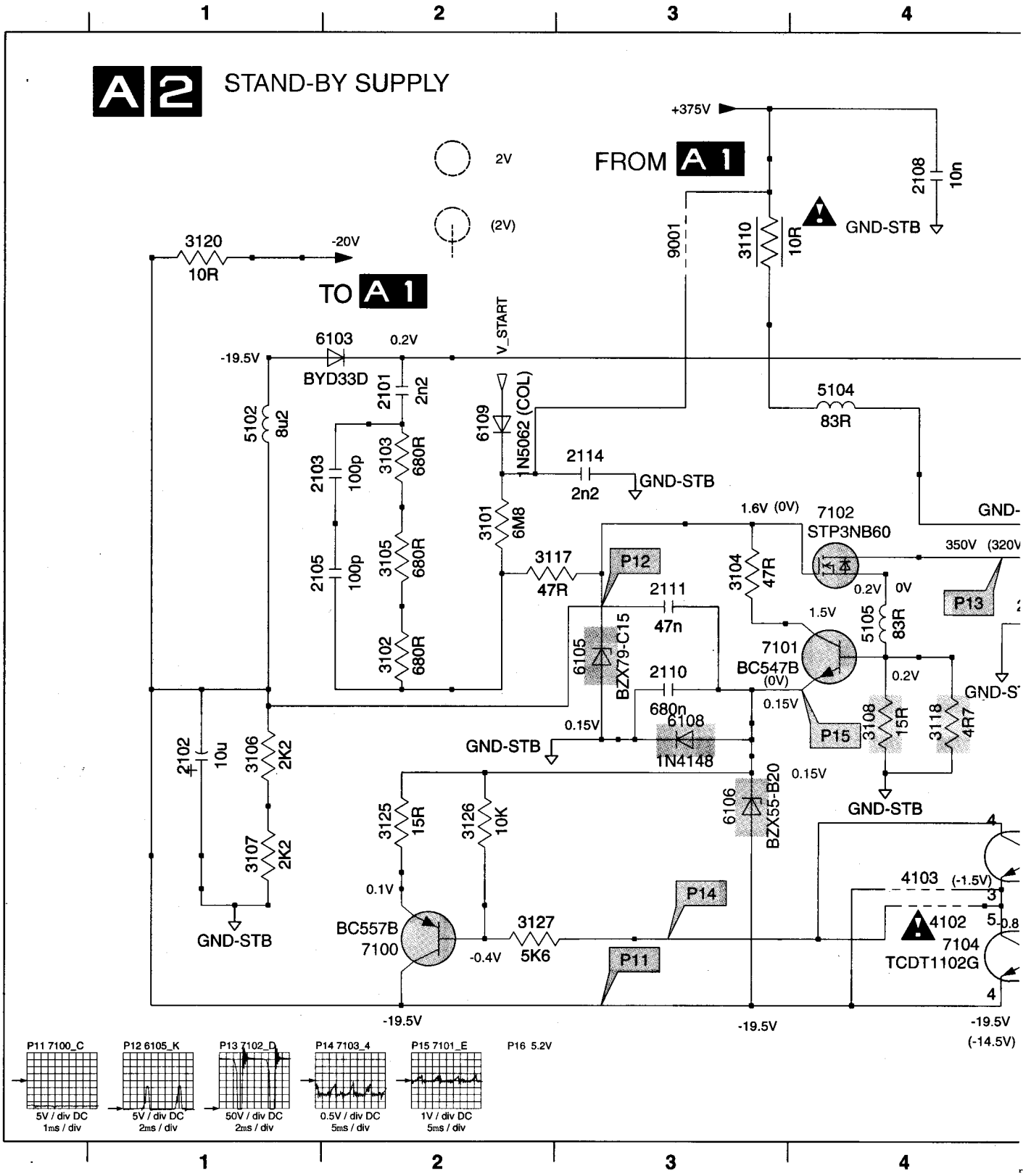


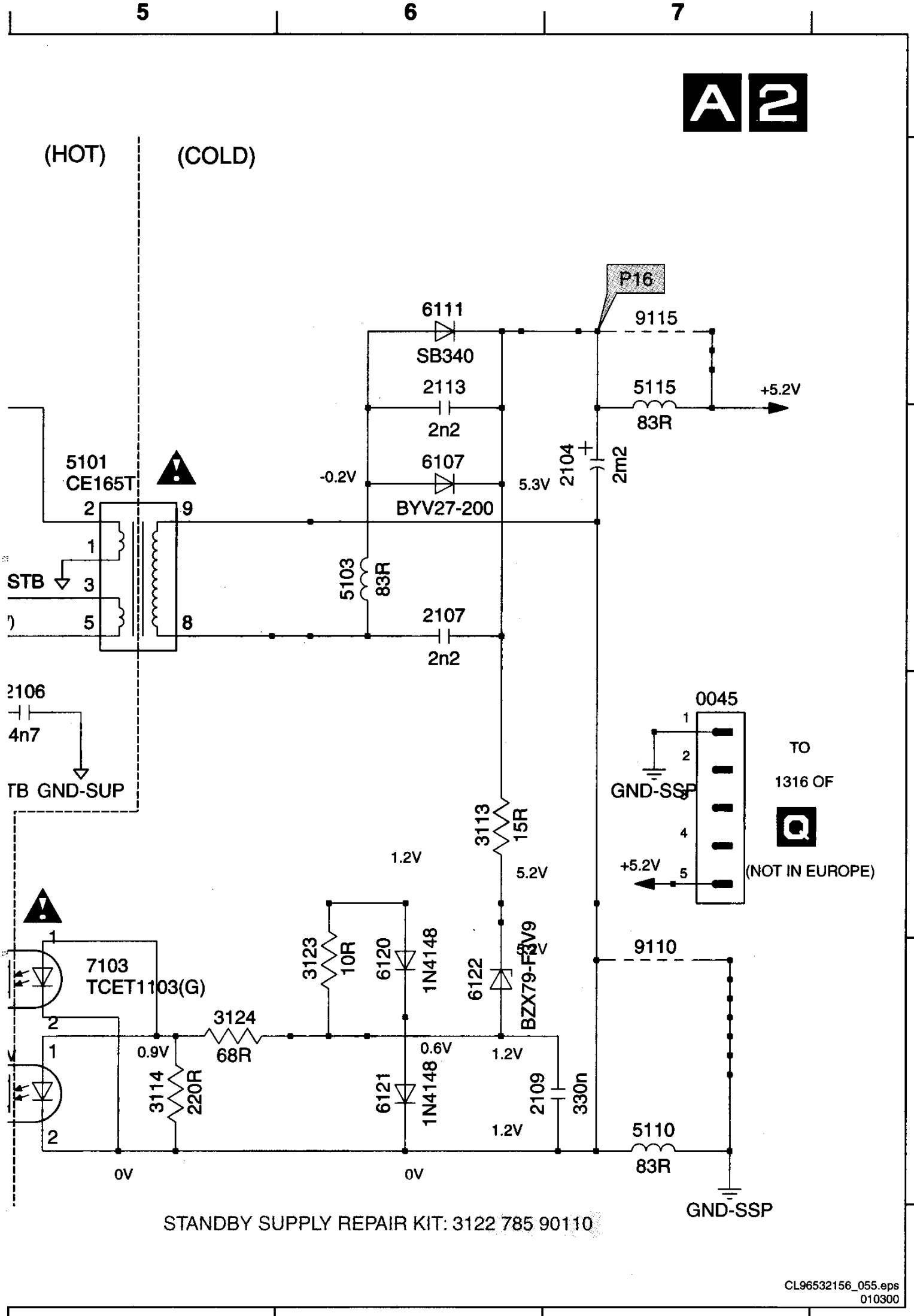


0001 A2 3537 B7
0002 C2 3538 C8
0003 C3 3539 B7
0010 B1 3540 C7
0020 C1 3541 C8
0030 A3 3542 E6
0035 B2 3543 A5
1001 A2 3544 B4
1002 D8 5503 B2
1003 C4 5504 A2
A 1501 A1 5505 B5
1503 A4 5506 A6
2501 B4 5510 C3
2502 B5 6501 A3
2503 A6 6502 A3
2505 C3 6503 B3
2507 A1 6504 B3
2508 A2 6505 A4
2509 A3 6506 B4
2510 B3 6507 A7
2512 A7 6508 B5
2513 C6 6510 A5
2514 D6 6511 D8
B 2515 B6 6512 D8
2516 A3 6514 B6
2517 B3 6515 B4
2518 A5 6516 E5
2519 A7 6517 E5
2520 B4 6518 D4
2521 C3 6520 B6
2523 A4 6521 C7
2528 E8 6522 C7
2530 E5 7502 B5
2531 D7 7504 A4
2535 C6 7505 D4
C 2536 B6 7506 D6
2537 A2 7510 C7
2538 C4 7511 B8
3500 A2 7528 D8
3501 A2 7529 E4
3502 C3 9501 A3
3503 C2 9502 B3
3504 B5 9503 B3
3507 D6 9504 A3
3508 A4
3509 A1
3510 D7
D 3511 A5
3512 A5
3513 A4
3514 B4
3515 B5
3516 D2
3518 A4
3519 D4
3520 C5
3521 B1
3522 D5
E 3523 D6
3524 D5
3525 D5
3526 E6
3527 D7
3528 E8
3529 D8
3530 E4
3531 D4
3533 E5
3535 B7
3536 B7

Standby supply

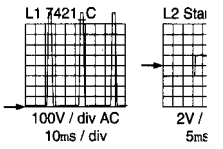
0045 C7	2107 B6	3101 B2	3108 C4	3123 D6	5101 B5	6103 A2	6120 D6	7104 D4
2101 B2	2108 A4	3102 C2	3110 A3	3124 D5	5102 B1	6105 C3	6121 D6	9001 A3
2102 C1	2109 D7	3103 B2	3113 C6	3125 D2	5103 B6	6106 C3	6122 D6	9110 D7
2103 B2	2110 C3	3104 B3	3114 D5	3126 D2	5104 B4	6107 B6	7100 D2	
2104 B7	2111 C3	3105 B2	3117 B2	3127 D2	5105 C4	6108 C3	7101 C4	
2105 B2	2113 A6	3106 C1	3118 C4	4102 D4	5110 D7	6109 B2	7102 B4	
2106 C5	2114 B3	3107 D1	3120 A1	4103 D4	5115 A7	6111 A6	7103 D5	

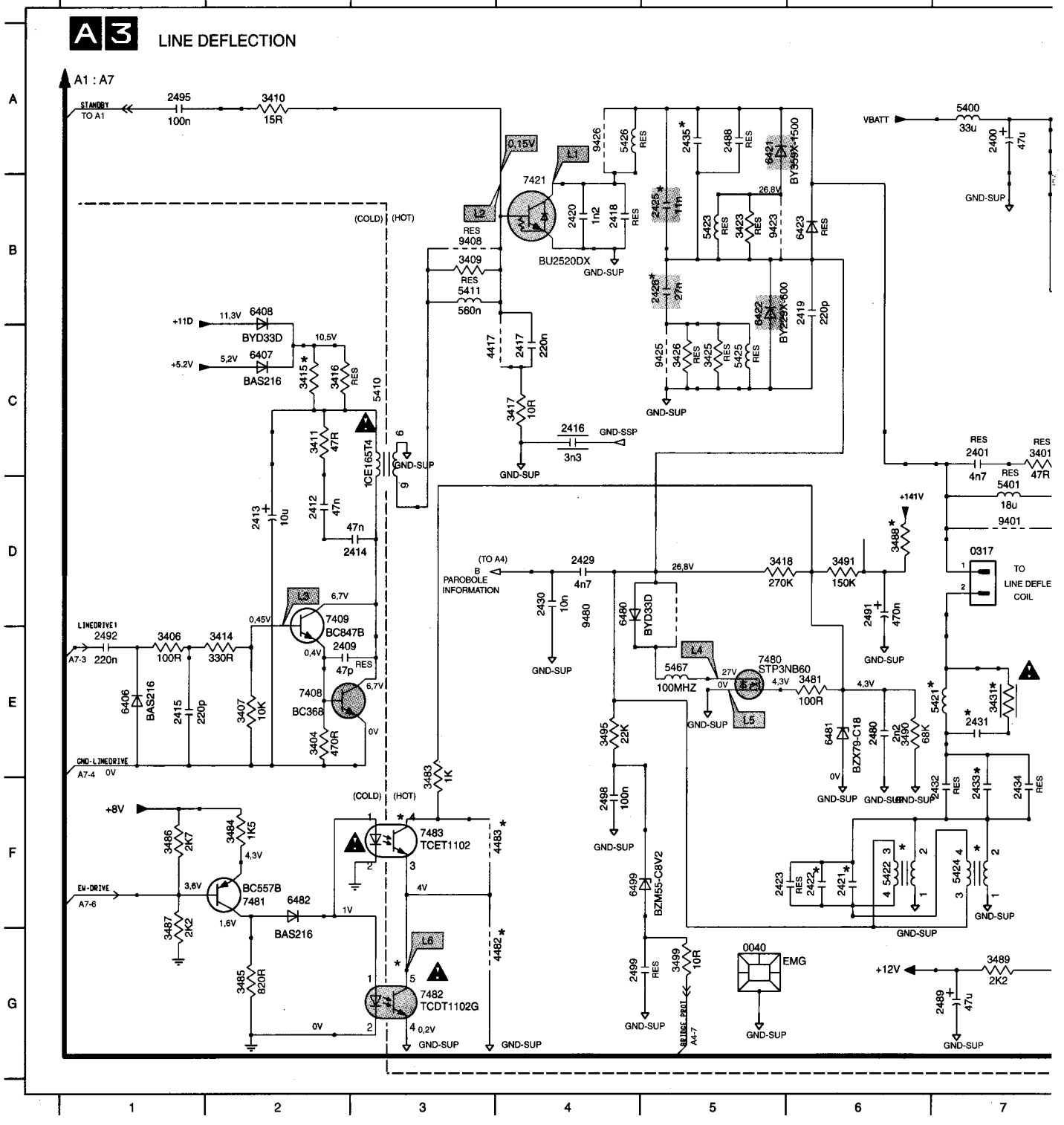


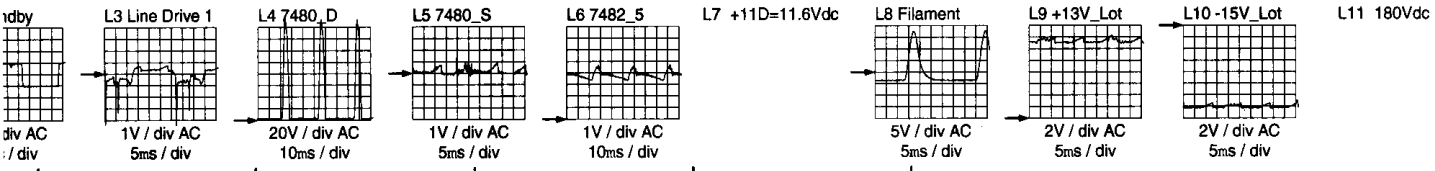

A2
(HOT)
(COLD)
P16
6111
SB340
9115
2113
2n2
5115
83R
+5.2V
2104
2m2
5101
CE165T
-0.2V
6107
BYV27-200
5.3V
5103
83R
STB
2107
2n2
2106
4n7
TB GND-SUP
0045
GND-SSP
TO
1316 OF
(NOT IN EUROPE)
3113
15R
1.2V
5.2V
7103
TCET1103(G)
3123
10R
6120
1N4148
6122
BZX79-F3V9
9110
3124
68R
0.9V
0.6V
1.2V
3114
220R
6121
1N4148
2109
330n
5110
83R
0V
0V
GND-SSP
STANDBY SUPPLY REPAIR KIT: 3122 785 90110
CL96532156_055.eps
010300

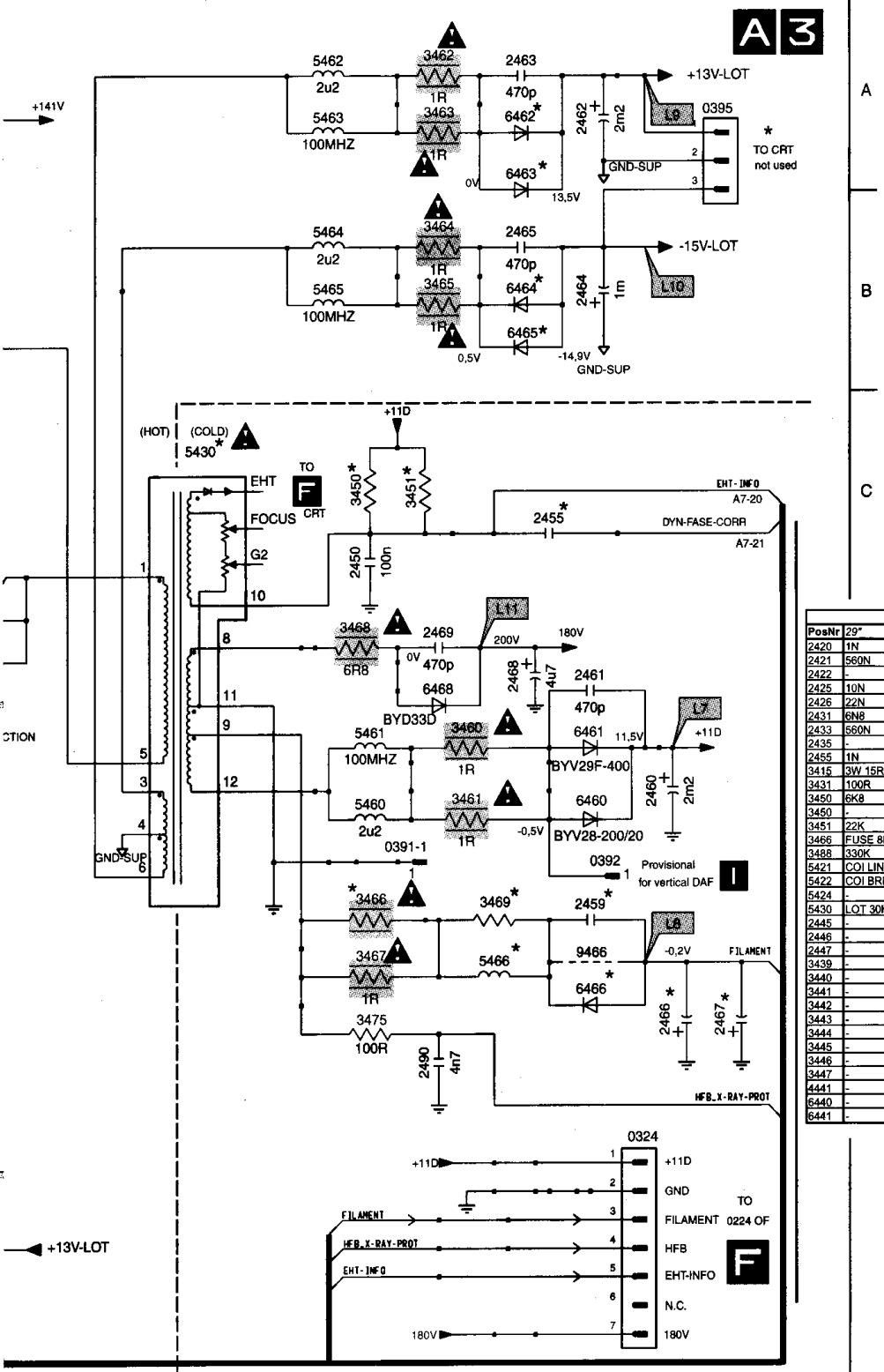
Line deflection

2400 A7	2421 F6	2450 C9	2469 D10	3406 E1	3426 C5	3468 D9	3491 D6	5423 B5	5467 E5	6465 B10	7482 G3
2401 C7	2422 F6	2455 C10	2480 E6	3407 E2	3431 E7	3469 E10	3495 E4	5424 F7	6406 E1	6466 F10	7483 F3
2409 E2	2423 F5	2459 E10	2488 A5	3409 B3	3450 C9	3475 F9	3499 G5	5425 C5	6407 C2	6468 D10	9401 D7
2412 D2	2425 B5	2460 D11	2489 G7	3410 A2	3451 C9	3481 E6	4417 C3	5426 A4	6408 B2	6480 D4	9408 B3
2413 D2	2426 B5	2461 D10	2490 F10	3411 C2	3460 D10	3483 F3	4482 G3	5430 C8	6421 A5	6481 E6	9423 B5
2414 D3	2429 D4	2462 A10	2491 D6	3414 E2	3461 E10	3484 F2	4483 F3	5460 E9	6422 B5	6482 F2	9425 C5







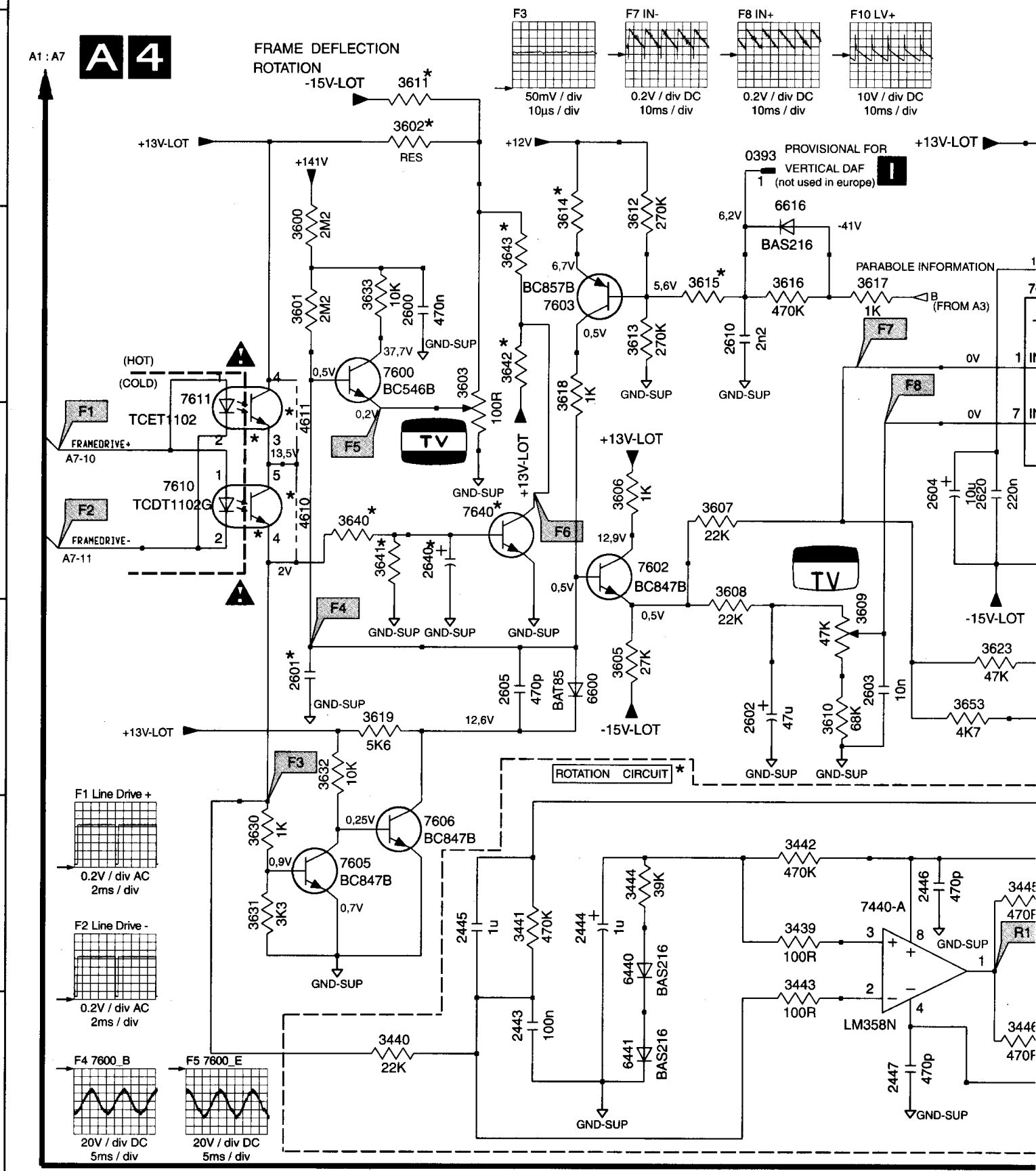


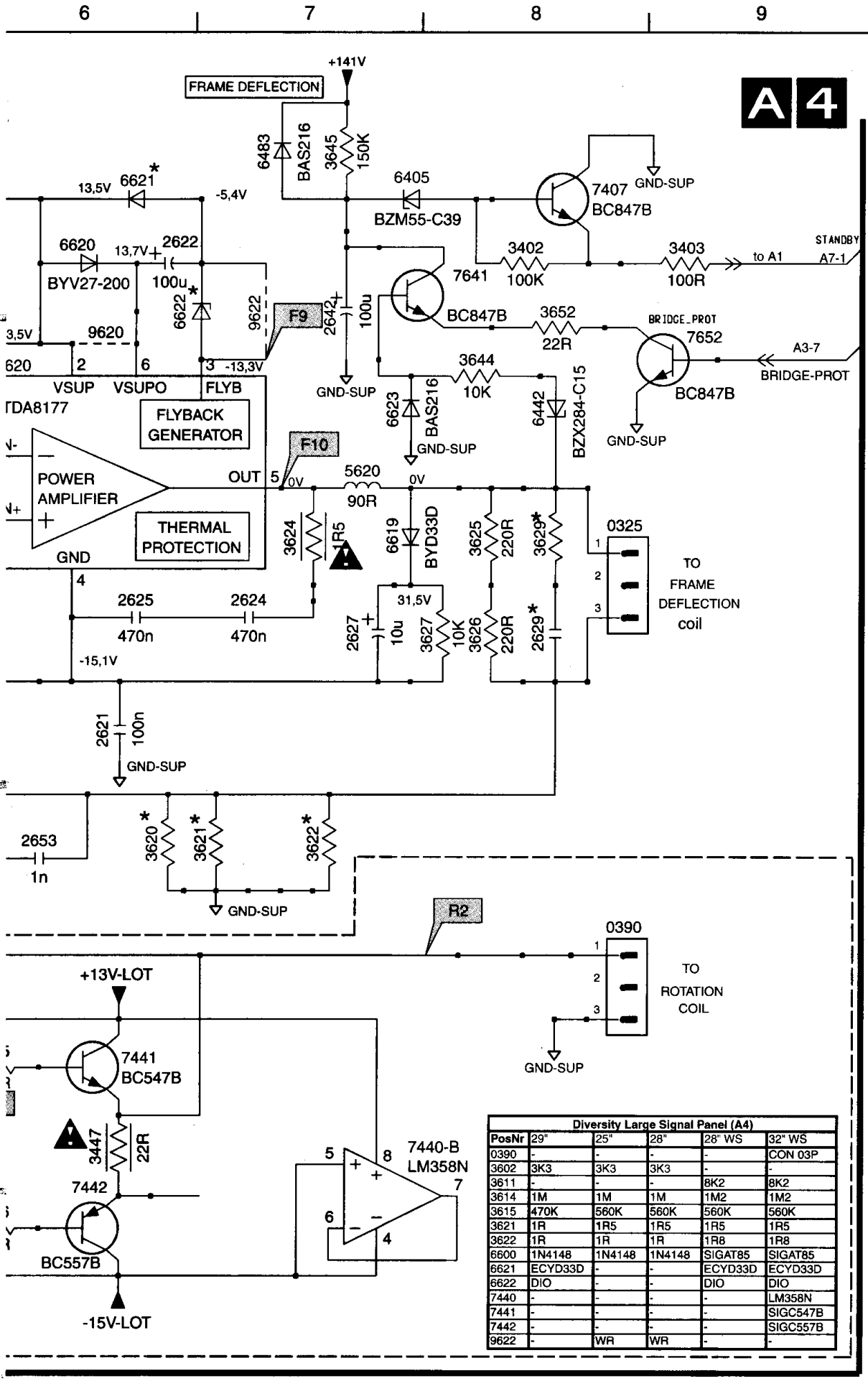
Diversity Large Signal Panel (A3)					
PosNr	29"	25"	28"	28" WS	32" WS
2420	1N	1N	1N	560P	1N
2421	560N	560N	470N	-	-
2422	-	-	-	21U2	21U2
2425	10N	9N1	-	11N	11N
2426	22N	24N	24N	24N	24N
2431	6N8	3N3	3N3	3N3	3N3
2433	560N	390N	470N	390N	430N
2435	-	-	9N1	-	-
2455	1N	-	-	3N3	3N3
3415	3W 15R	3W 15R	3W 15R	PR03 12R	PR03 12R
3431	100R	220R	220R	220R	220R
3450	6K8	-	-	10K	10K
3450	-	8K2	8K2	-	-
3451	22K	22K	22K	10K	10K
3466	FUSE 8R2	6R8	FUSE 8R2	1R	1R
3488	330K	220K	220K	220K	120K
5421	COI LINCOR DRUM	COI LINCOR DC12 8MH	COI LINCOR DRUM	COI LINCOR DRUM	COI LINCOR DRUM
5422	COI BRIDGE	-	-	COI BRIDGE	COI BRIDGE
5424	-	COI BRIDGE	COI BRIDGE	-	-
5430	LOT 30KV ISO ELDOR	LOT PWRSL. 27K5	LOT PWRSL. 27K5	LOT PWRSL. 30KV	LOT PWRSL. 30KV
2445	-	-	-	-	1U
2446	-	-	-	-	470P
2447	-	-	-	-	470P
3439	-	-	-	-	100R
3440	-	-	-	-	22K
3441	-	-	-	-	470K
3442	-	-	-	-	470K
3443	-	-	-	-	100R
3444	-	-	-	-	39K
3445	-	-	-	-	2K2
3446	-	-	-	-	2K2
3447	-	-	-	-	22R
4441	-	-	-	-	JUMP
6440	-	-	-	-	SMAS216
6441	-	-	-	-	SMAS216

MAIN LINE REPAIR KIT: 3122 785 90120

CL96532156_056.eps
010300

Frame deflection



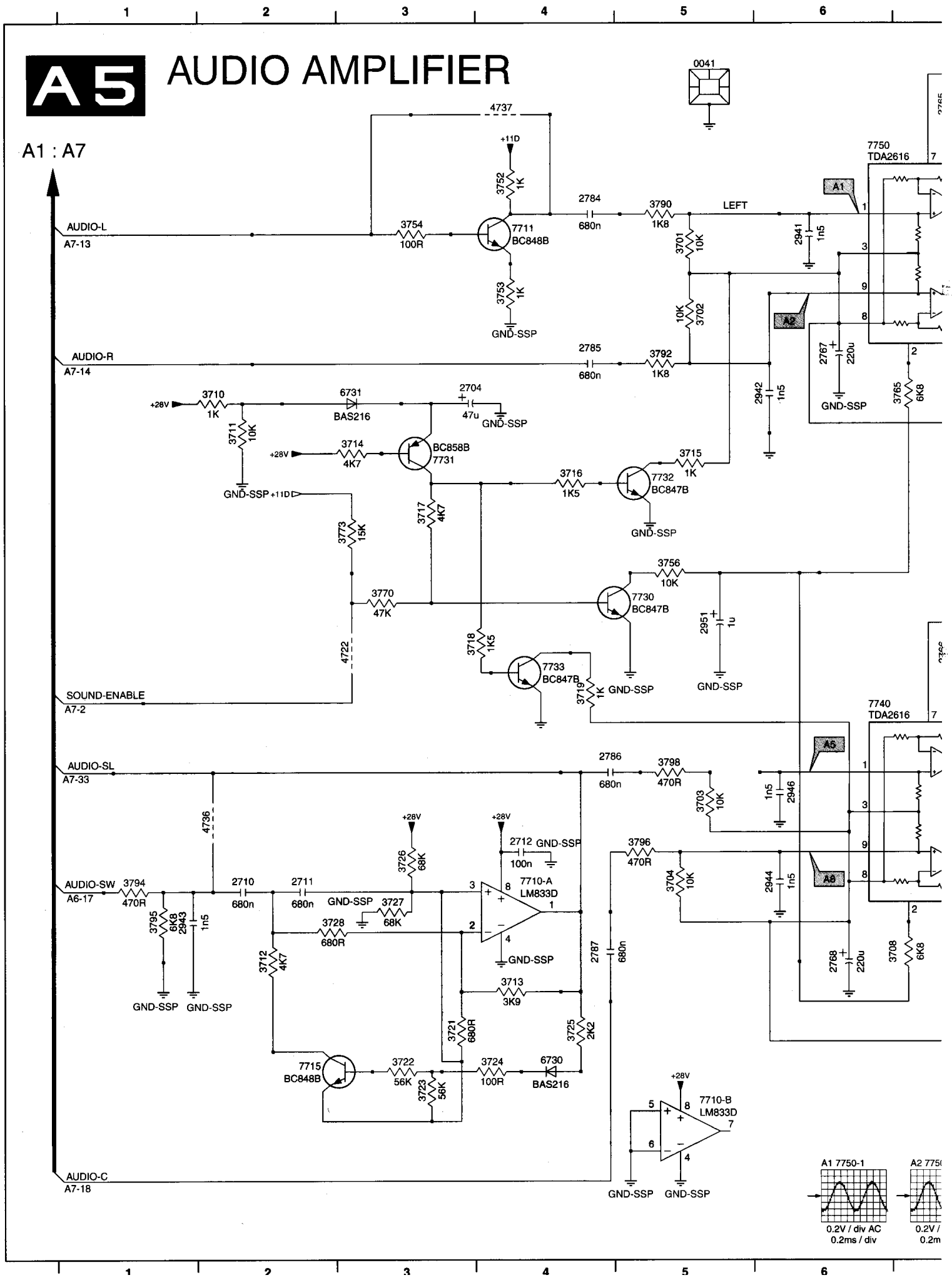


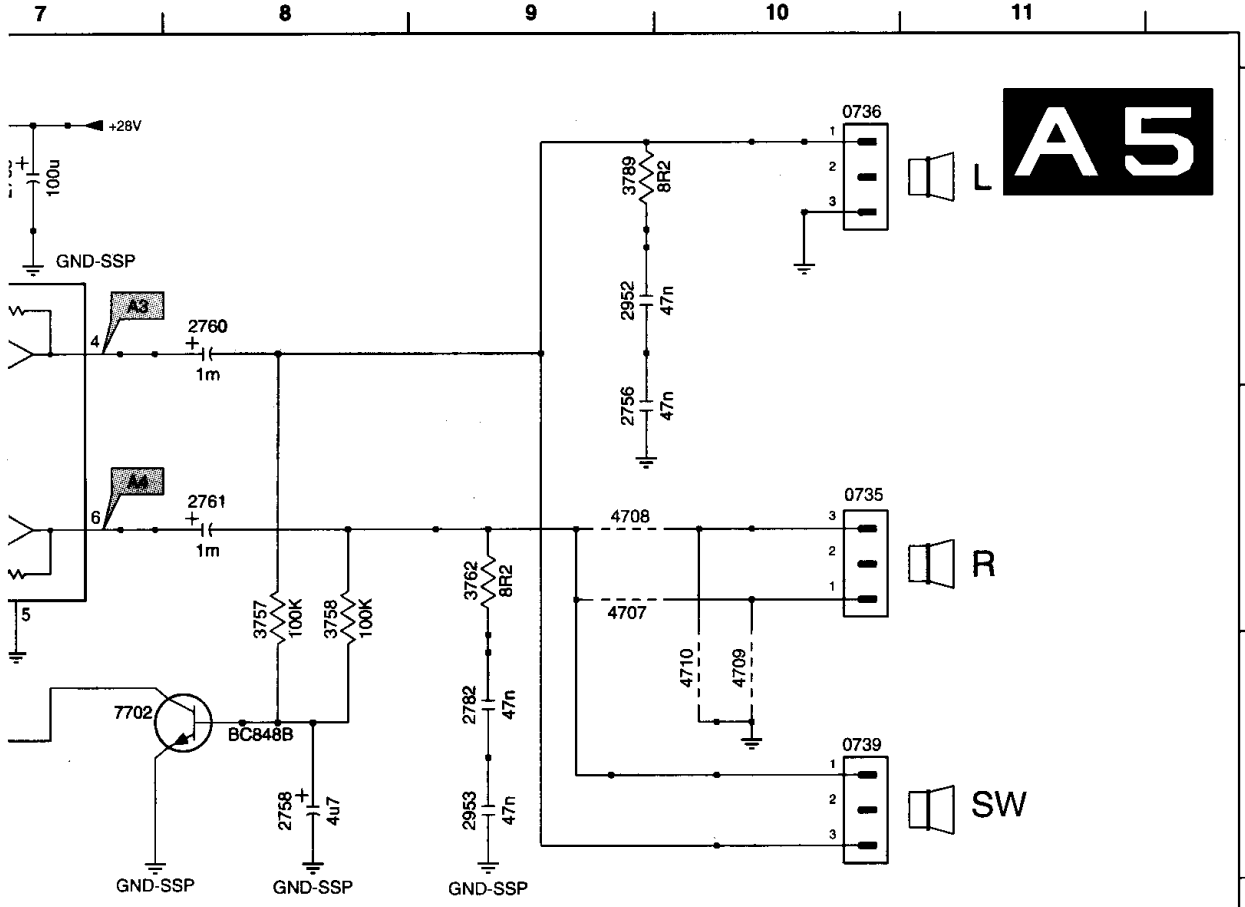
Diversity Large Signal Panel (A4)					
PosNr	29"	25"	28"	28" WS	32" WS
0390	-	-	-	-	CON 03P
3602	3K3	3K3	3K3	-	-
3611	-	-	-	8K2	8K2
3614	1M	1M	1M	1M2	1M2
3615	470K	560K	560K	560K	560K
3621	1R	1R5	1R5	1R5	1R5
3622	1R	1R	1R	1R8	1R8
6600	1N4148	1N4148	1N4148	SIGAT85	SIGAT85
6621	ECYD33D	-	-	ECYD33D	ECYD33D
6622	DIO	-	-	DIO	DIO
7440	-	-	-	-	LM358N
7441	-	-	-	-	SIGC547B
7442	-	-	-	-	SIGC557B
9622	-	WR	WR	-	-

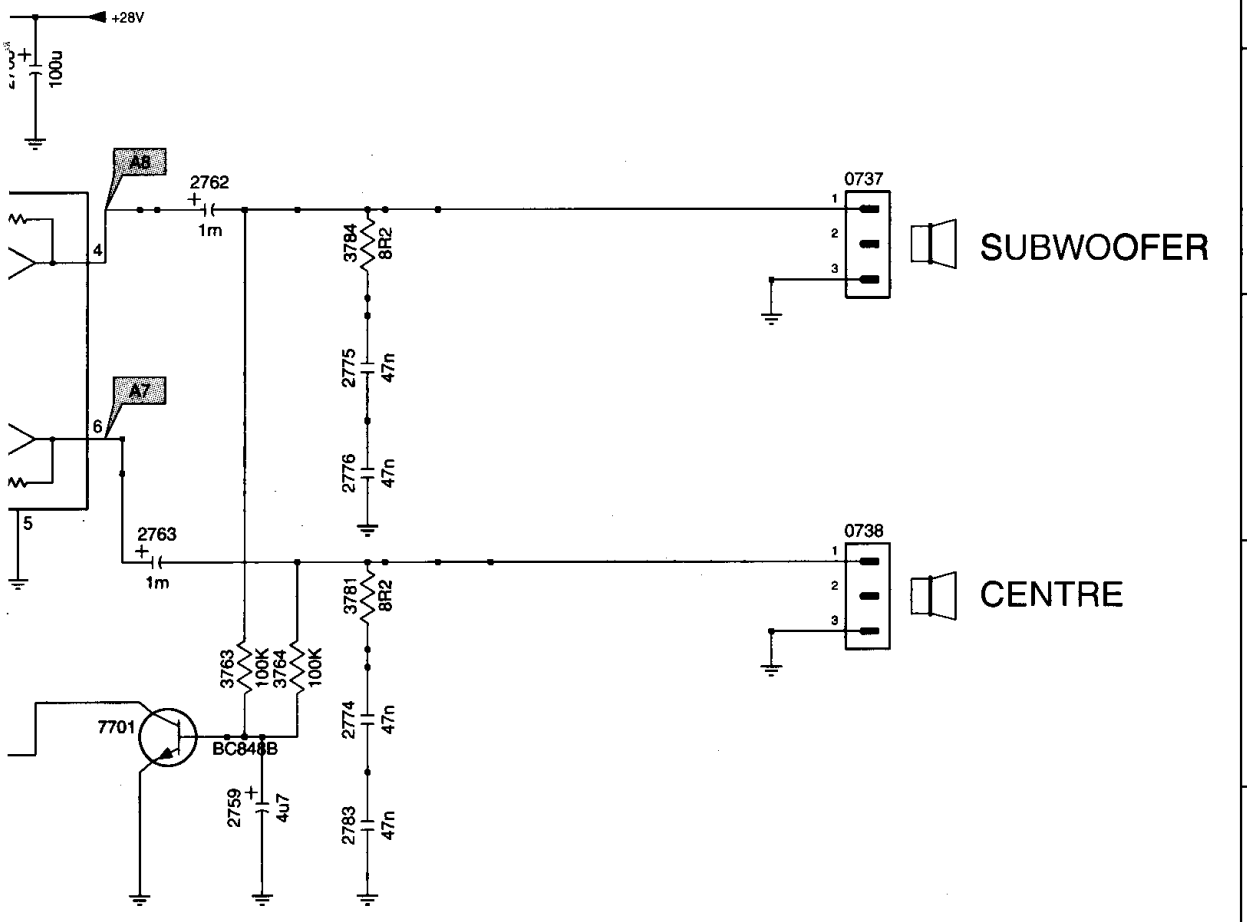
CL96532156_057.eps
030100

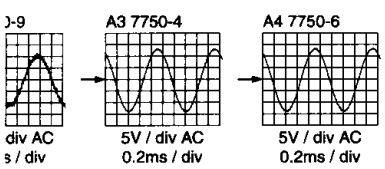
A	0325 C8	3645 A7
	0390 D8	3652 B8
	0393 A4	3653 D5
	2443 F3	4610 C2
	2444 E3	4611 C2
	2445 E3	5620 B7
	2446 E5	6405 A7
	2447 F5	6440 E4
	2600 B2	6441 F4
	2601 D2	6442 B8
	2602 D4	6483 A7
	2603 D5	6600 D3
	2604 C5	6616 B4
	2605 D3	6619 C7
	2610 B4	6620 A6
	2620 C5	6621 A6
	2621 D6	6622 B6
	2622 A6	6623 B7
	2624 C7	7407 A8
B	2625 C6	7440-A E5
	2627 C7	7440-B E7
	2629 C8	7441 E6
	2640 C3	7442 F6
	2642 B7	7600 B2
	2653 D6	7602 C4
	3402 A8	7603 B3
	3403 A9	7605 E2
	3439 E4	7606 E3
	3440 F2	7610 C1
	3441 E3	7611 C1
	3442 E4	7620 B6
C	3443 E4	7640 C3
	3444 E4	7641 B8
	3445 E6	7652 B9
	3446 F6	9620 B6
	3447 E6	
	3600 B2	
	3601 B2	
	3602 A2	
	3603 B3	
	3605 D4	
	3606 C4	
	3607 C4	
D	3608 C4	
	3609 D5	
	3610 D5	
	3611 A2	
	3612 B4	
	3613 B4	
	3614 B3	
	3615 B4	
	3616 B4	
	3617 B5	
	3618 B3	
E	3619 D2	
	3620 D6	
	3621 D7	
	3622 D7	
	3623 D5	
	3624 C7	
	3625 C8	
	3626 C8	
	3627 C8	
	3629 C8	
	3630 E2	
	3631 E2	
F	3632 D2	
	3633 B2	
	3640 C2	
	3641 C2	
	3642 B3	
	3643 B3	
	3644 B8	

Audio amplifier





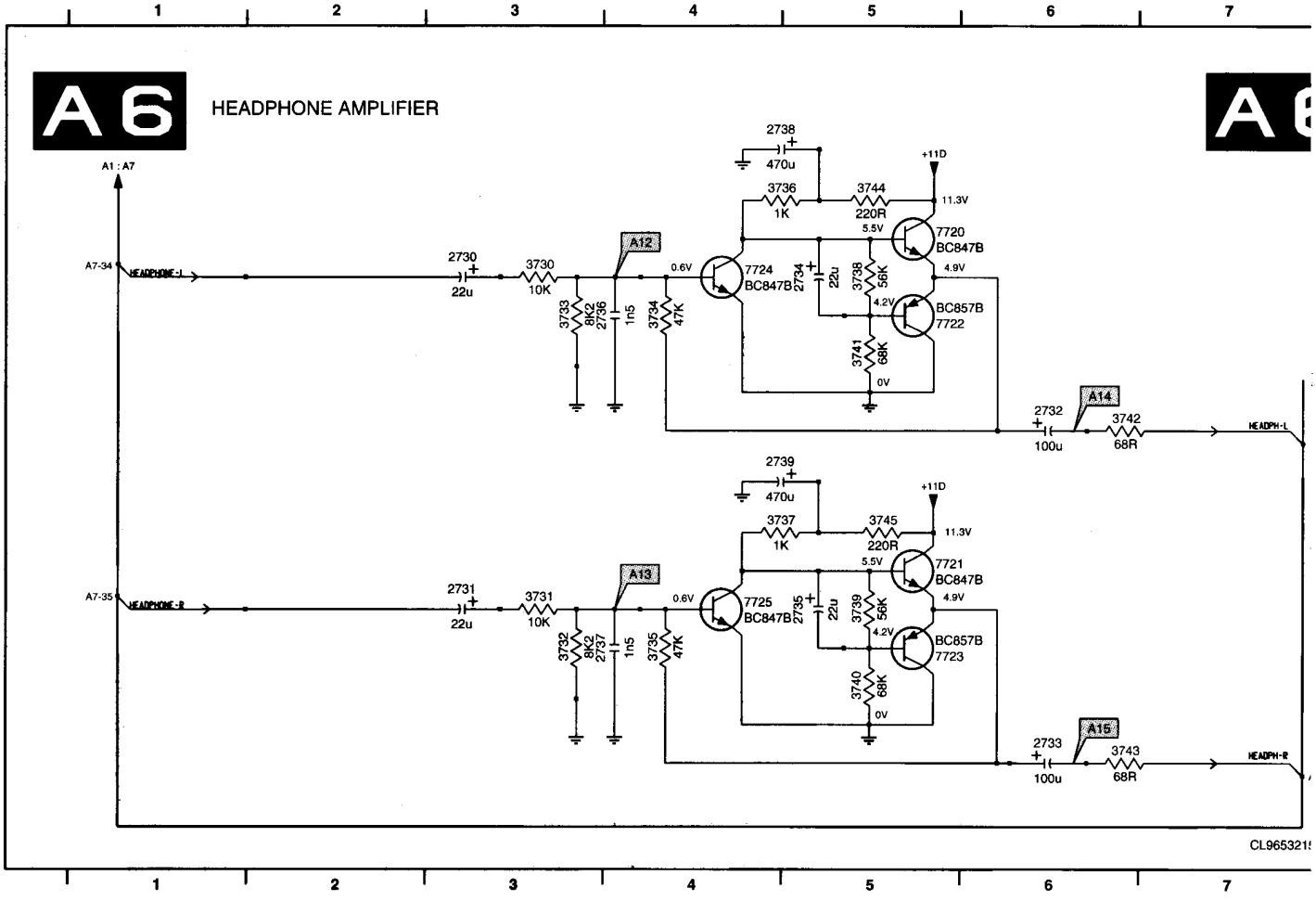




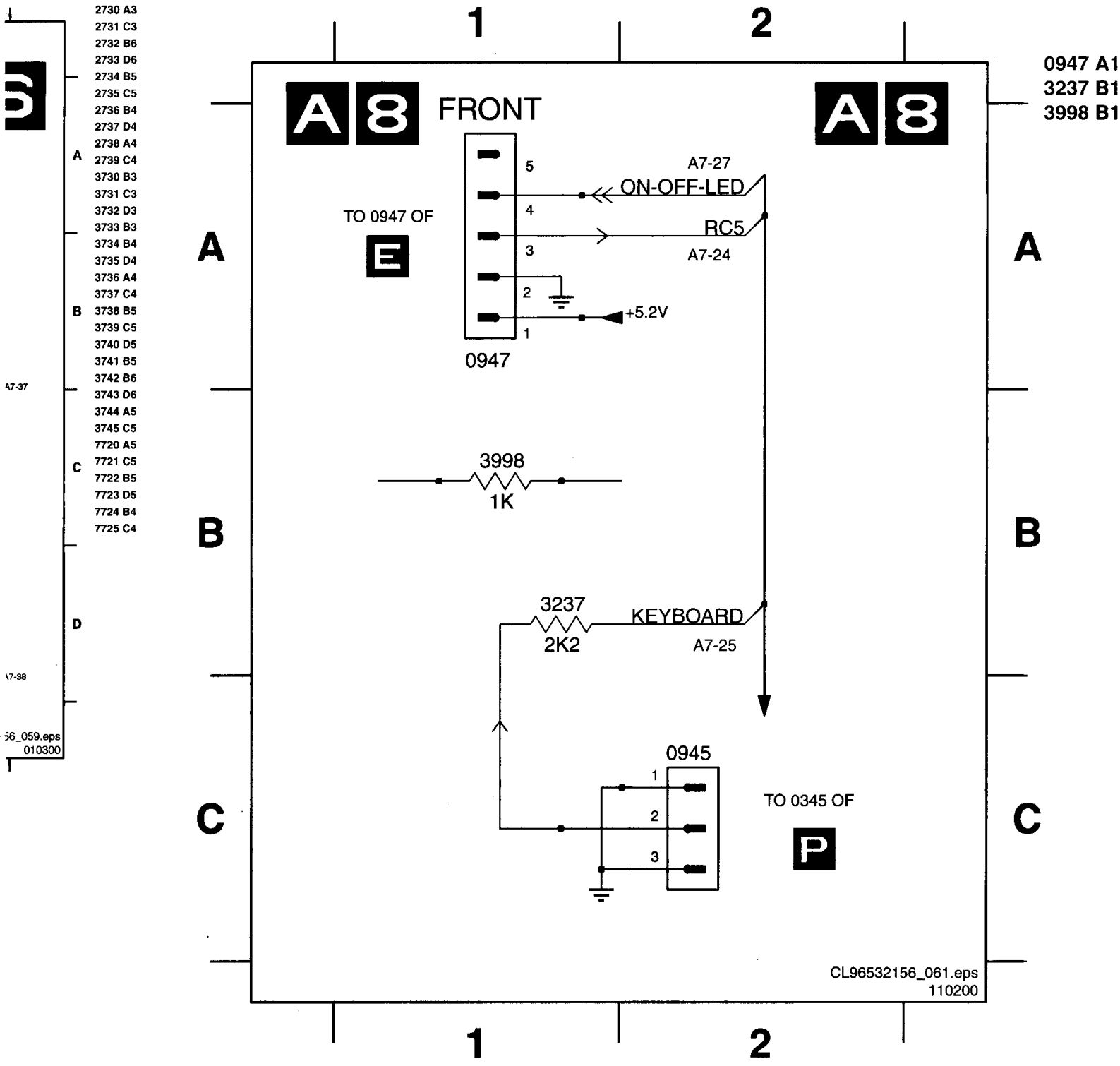
CL96532156_058.eps
100200

0041 A5
0735 B10
0736 A10
0737 E10
0738 F10
0739 C10
2704 C3
2710 F2
2711 F2
2712 F4
2756 B9
2758 C8
2759 H8
2760 A8
2761 B8
2762 E8
2763 F7
2765 A7
2766 E7
2767 B6
2768 G6
2774 G8
2775 F8
2776 F8
2782 C9
2783 H8
2784 A4
2785 B4
2786 E4
2787 G4
2941 B6
2942 C6
2943 G1
2944 F6
2946 F6
2951 D5
2952 A9
2953 C9
3701 B5
3702 B5
3703 F5
3704 F5
3708 G7
3710 C2
3711 C2
3712 G2
3713 G4
3714 C3
3715 C5
3716 C4
3717 D3
3718 E3
3719 E4
3721 G3
3722 H3
3723 H3
3724 H4
3725 G4
3726 F3
3727 F3
3728 G2
3752 A4
3753 B4
3754 B3
3756 D5
3757 B8
3758 B8
3762 B9
3763 G8
3764 G8
3765 C7
3770 D3
3773 D3
3781 G8
3784 E8
3789 A9
3790 A5
3792 B5
3794 F1
3795 G1
3796 F5
3798 E5
4707 B9
4708 B9
4709 C10
4710 C10
4722 E3
4736 F2
4737 A4
6730 H4
6731 C3
7701 G7
7702 C7
7710-A F4
7710-B H5
7711 B4
7715 H2
7730 D5
7731 C3
7732 C5
7733 E4
7740 E6
7750 A6

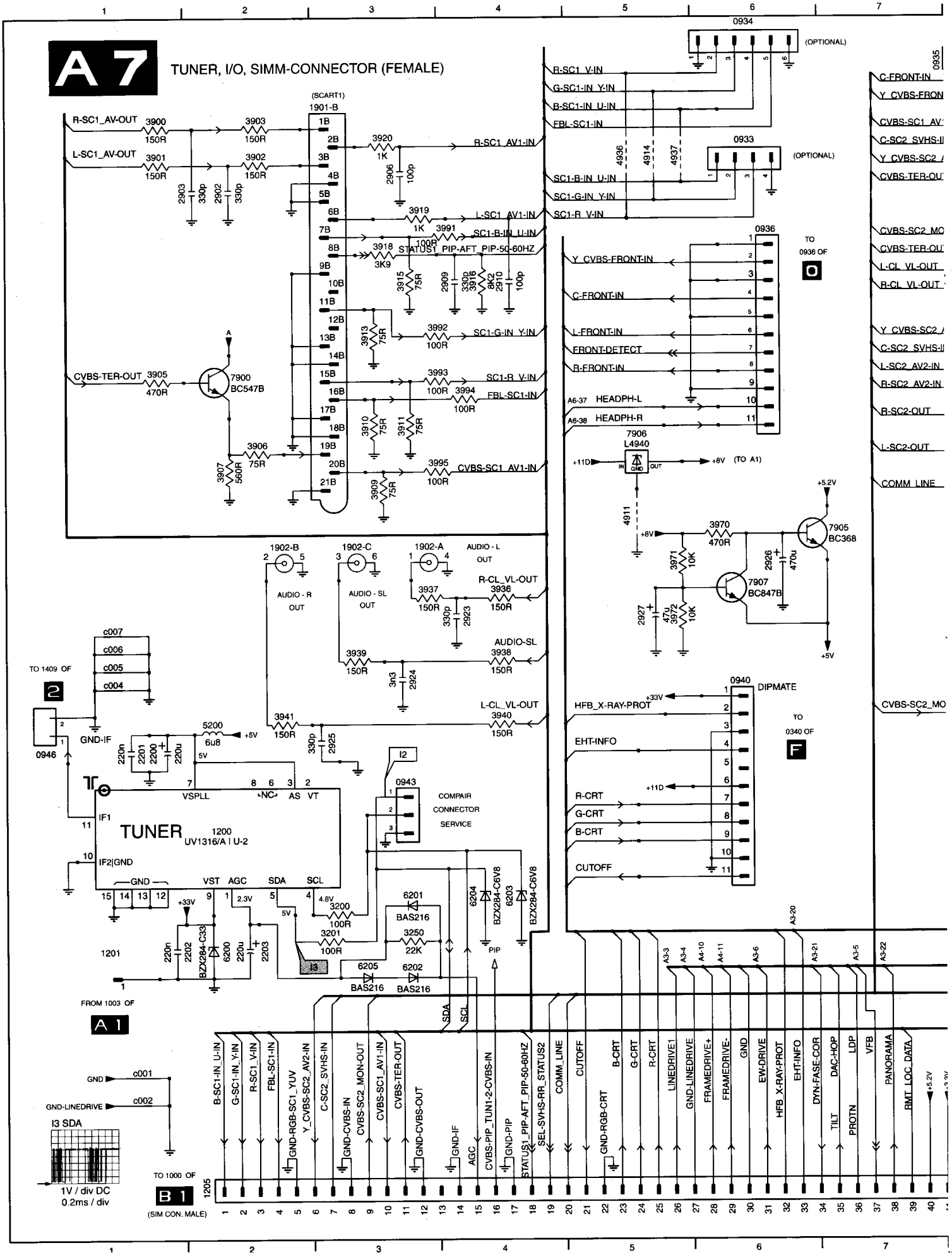
Headphone amplifier

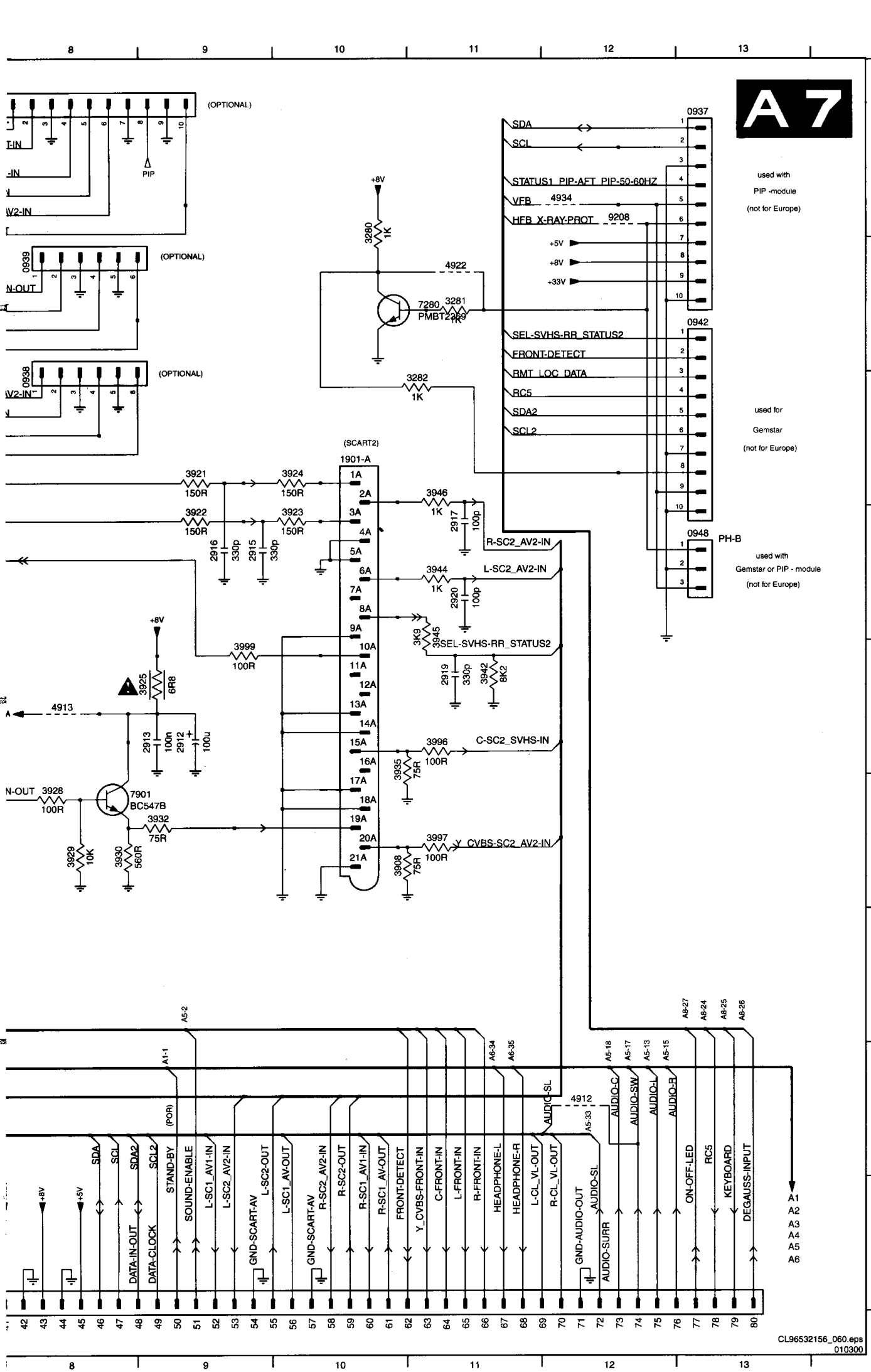


Front


2730 A3
2731 C3
2732 B6
2733 D6
2734 B5
2735 C5
2736 B4
2737 D4
2738 A4
2739 C4
3730 B3
3731 C3
3732 D3
3733 B3
3734 B4
3735 D4
3736 A4
3737 C4
3738 B5
3739 C5
3740 D5
3741 B5
3742 B6
3743 D6
3744 A5
3745 C5
7720 A5
7721 C5
7722 B5
7723 D5
7724 B4
7725 C4
A7-37
A7-38
56_059.eps
010300
1
2
A8 FRONT
A8
0947 A1
3237 B1
3998 B1
A
B
C
TO 0947 OF
E
5
4
3
2
1
A7-27
ON-OFF-LED
RC5
A7-24
+5.2V
0947
3998
1K
3237
2K2
KEYBOARD
A7-25
0945
TO 0345 OF
P
CL96532156_061.eps
110200

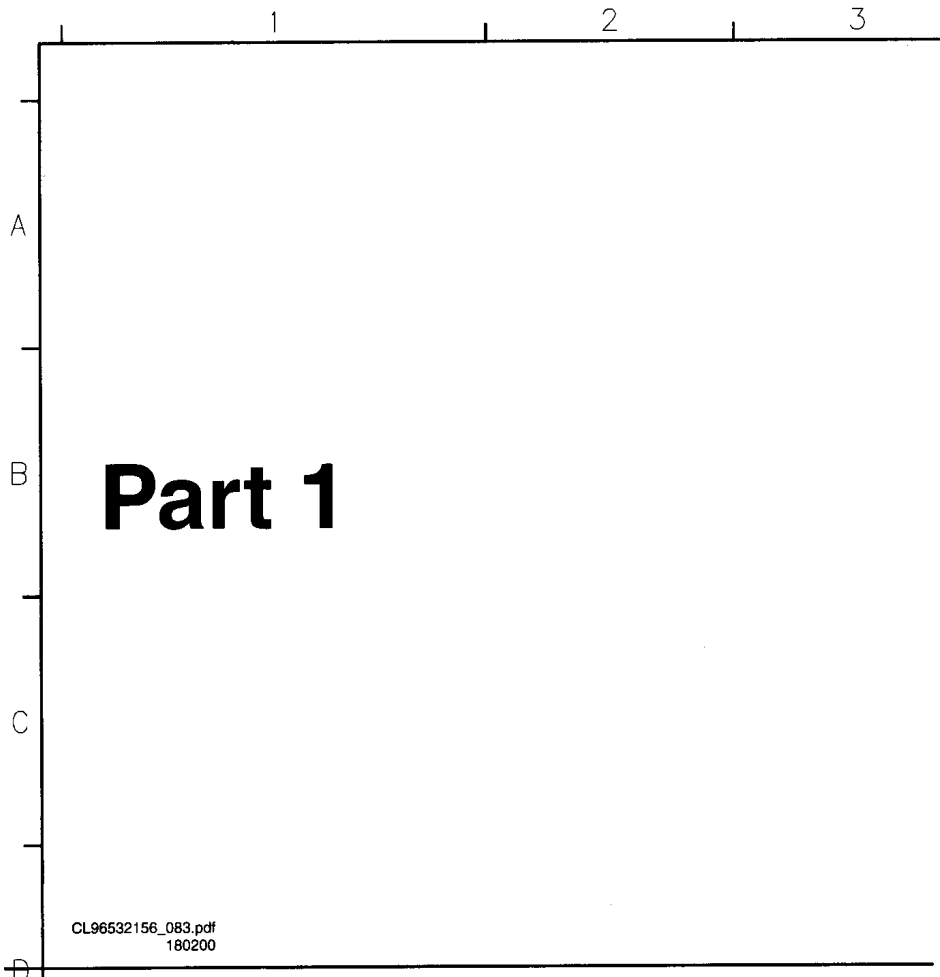
Tuner, I/O, Simm connector (female)

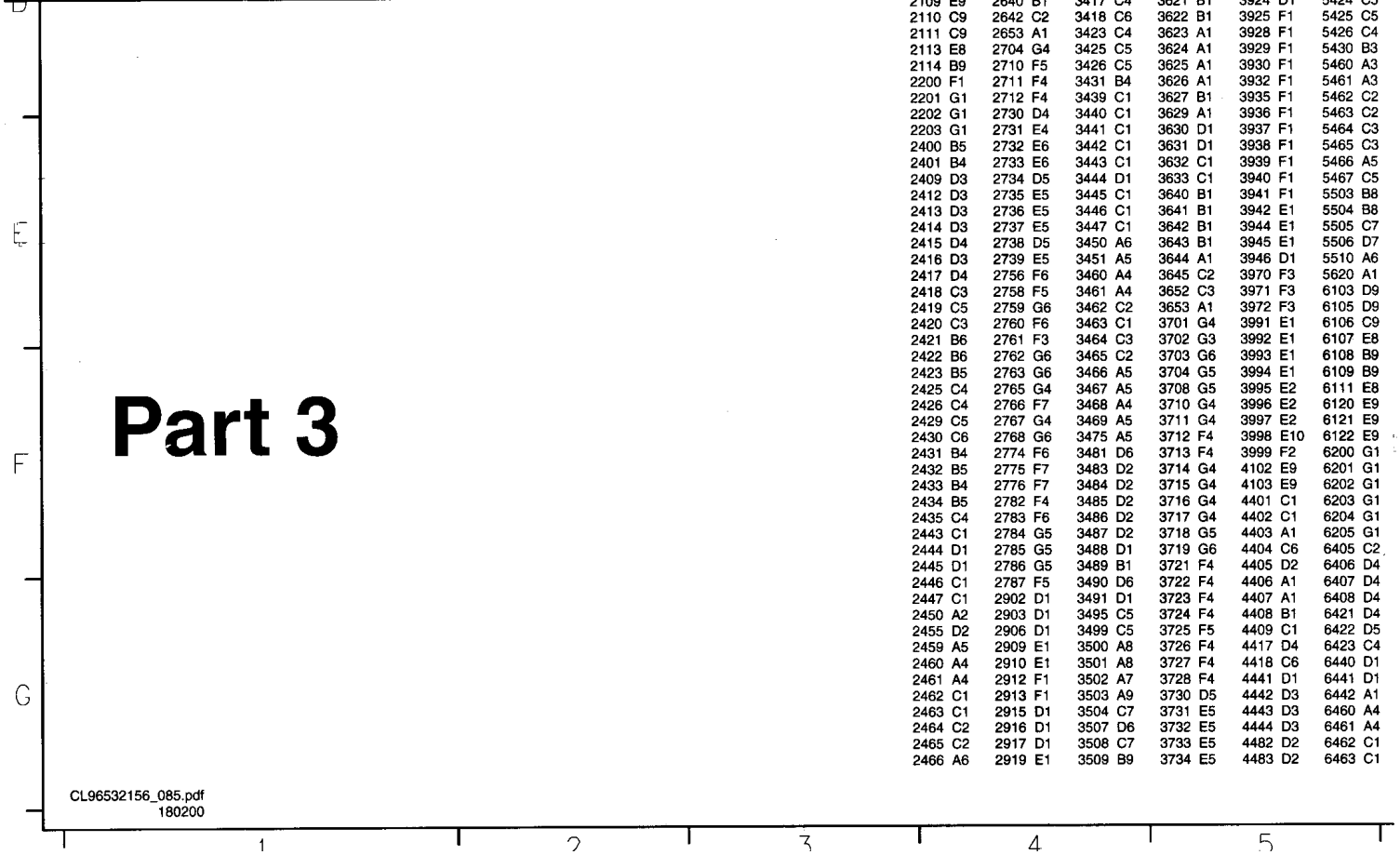




0933 A6 7906 C5
0934 A6 7907 E6
0935 A7 9208 A12
0936 B6 c001 I1
0937 A13 c002 I1
0938 C8 c004 E1
0939 B8 c005 E1
0940 E6 c006 E1
0942 B13 c007 E1
0943 F3
0946 F1
0948 D13
1200 G2
1201 H1
1205 I2
1901-A C10
1901-B A2
1902-A D3
1902-B D2
1902-C D3
2200 F1
2201 F1
2202 H1
2203 H2
2902 B2
2903 B2
2906 A3
2909 B4
2910 B4
2912 E9
2913 E9
2915 D9
2916 D9
2917 D11
2919 E11
2920 D11
2923 E4
2924 E3
2925 F3
2926 D6
2927 E5
3200 G3
3201 G3
3250 G3
3280 A10
3281 B11
3282 C11
3900 A1
3901 A1
3902 A2
3903 A2
3905 C1
3906 D2
3907 D2
3908 F10
3909 D3
3910 C3
3911 C3
3913 C3
3915 B3
3916 B4
3918 B3
3919 B3
3920 A3
3921 C9
3922 D9
3923 D10
3924 C10
3925 E9
3928 F8
3929 F8
3930 F8
3932 F9
3935 E10
3936 E4
3937 E3
3938 E4
3939 E3
3940 F4
3941 F2
3942 E11
3944 D11
3945 D11
3946 C11
3970 D6
3971 D5
3972 E5
3991 B4
3992 C4
3993 C4
3994 C4
3995 D4
3996 E11
3997 F11
3999 E9
4911 D5
4912 H12
4913 E8
4914 A5
4922 B11
4934 A12
4936 A5
4937 A5
5200 F2
6200 H2
6201 G3
6202 H3
6203 G4
6204 G4
6205 H3
7280 B11
7900 C2
7901 F8
7905 D7

LSP (copper side overview)





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0020 C8	2468 A5	2923 F1	3511 D7	3736 D5	4522 D7
0030 A7	2469 A4	2924 F1	3512 C7	3737 E5	4610 D1
0035 A7	2480 C6	2925 F1	3513 B7	3738 D5	4611 D1
0040 D5	2488 C4	2926 E3	3514 C7	3739 E5	4701 F5
0041 G5	2489 C1	2927 F3	3515 B6	3740 E5	4702 G5
0045 F7	2490 A6	2941 G4	3516 C8	3741 D5	4707 F5
0317 B4	2491 D2	2942 G4	3518 C7	3742 F5	4708 F6
0324 A6	2492 D4	2943 F5	3519 C7	3743 E5	4709 F6
0325 A1	2495 D3	2944 G5	3520 C7	3744 D5	4710 F6
0390 D1	2498 B5	2946 G6	3521 A9	3745 E5	4722 F5
0391 A2	2499 C5	2951 G5	3522 C7	3752 F5	4723 G6
0392 A4	2501 C7	2952 F6	3523 D7	3753 F5	4724 F5
0393 C1	2502 C7	2953 F4	3524 C7	3754 F5	4736 F5
0395 B1	2503 D7	3101 C9	3525 C7	3756 G5	4737 F5
0735 F6	2505 A6	3102 D9	3526 B6	3757 F6	4910 E1
0736 F6	2507 B8	3103 D9	3527 D6	3758 F5	4911 F2
0737 F7	2508 A7	3104 C9	3528 E8	3762 F4	4912 E4
0738 F6	2509 A7	3105 D9	3529 E8	3763 G6	4913 F1
0739 F5	2510 B6	3106 E9	3530 D7	3764 F6	4914 E1
0933 F1	2512 E6	3107 D9	3531 C7	3765 G5	4916 G1
0934 E1	2513 D7	3108 C9	3533 D6	3770 F5	4917 F1
0935 F1	2514 D7	3110 C8	3535 E6	3773 F5	4919 E4
0936 E4	2515 C6	3113 E9	3536 E6	3781 F6	4920 E1
0937 G2	2516 B7	3114 E9	3537 E6	3784 F7	4922 G3
0938 F1	2517 A6	3117 D9	3538 E6	3789 F6	4923 E5
0939 F2	2518 C7	3118 C9	3539 E6	3790 G4	4924 E5
0940 E2	2519 E7	3120 E9	3540 D6	3792 G5	4925 E5
0942 G3	2520 C7	3123 E9	3541 E6	3794 F5	4926 F5
0943 G1	2521 A6	3124 E9	3542 B6	3795 F5	4927 F5
0945 E10	2523 C6	3125 C10	3543 C7	3796 F5	4928 F5
0946 G2	2528 E8	3126 C10	3544 B7	3798 G5	4929 G1
0947 A10	2530 D7	3127 C9	3600 C1	3900 D1	4932 E1
0948 G2	2531 D6	3200 G1	3601 C1	3901 D1	4934 G3
1001 A8	2535 E6	3201 G1	3602 B1	3902 D1	4935 E1
1002 D8	2536 E7	3237 E9	3603 B1	3903 D1	4936 E1
1003 A6	2537 A8	3250 G1	3605 A1	3905 E1	4937 E1
1200 G1	2538 B7	3280 G3	3606 B1	3906 E1	5101 E8
1201 F1	2600 C1	3281 G3	3607 A1	3907 E1	5102 D9
1205 E3	2601 C1	3282 G3	3608 A1	3908 F1	5103 E8
1501 B9	2602 B1	3401 B4	3609 A1	3909 F1	5104 D8
1503 B7	2603 A1	3402 D3	3610 A1	3910 E1	5105 C8
1901 E1	2604 A1	3403 D3	3611 B1	3911 E1	5110 E7
1902 F1	2605 C1	3404 D3	3612 B1	3913 E1	5115 E7
2101 D9	2610 B1	3406 D4	3613 B1	3915 E1	5200 G2
2102 D9	2620 A1	3407 D4	3614 B1	3916 E1	5400 A6
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2106 C9	2625 A1	3414 D4	3618 B1	3921 D2	5421 B4
2107 E9	2627 A1	3415 D4	3619 C1	3922 E2	5422 C6
2108 C9	2629 A1	3416 D4	3620 B1	3923 D1	5423 C5
2109 E9	2640 B1	3417 C4	3621 B1	3924 D1	5424 C5
2110 C9	2642 C2	3418 C6	3622 B1	3925 F1	5425 C5
2111 C9	2653 A1	3423 C4	3623 A1	3928 F1	5426 C4
2113 E8	2704 G4	3425 C5	3624 A1	3929 F1	5430 B3
2114 B9	2710 F5	3426 C5	3625 A1	3930 F1	5460 A3
2200 F1	2711 F4	3431 B4	3626 A1	3932 F1	5461 A3
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2202 G1	2730 D4	3440 C1	3629 A1	3936 F1	5463 C2
2203 G1	2731 E4	3441 C1	3630 D1	3937 F1	5464 C3
2400 B5	2732 E6	3442 C1	3631 D1	3938 F1	5465 C3
2401 B4	2733 E6	3443 C1	3632 C1	3939 F1	5466 A5
2409 D3	2734 D5	3444 D1	3633 C1	3940 F1	5467 C5
2412 D3	2735 E5	3445 C1	3640 B1	3941 F1	5503 B8
2413 D3	2736 E5	3446 C1	3641 B1	3942 E1	5504 B8
2414 D3	2737 E5	3447 C1	3642 B1	3944 E1	5505 C7
2415 D4	2738 D5	3450 A6	3643 B1	3945 E1	5506 D7
2416 D3	2739 E5	3451 A5	3644 A1	3946 D1	5510 A6
2417 D4	2756 F6	3460 A4	3645 C2	3970 F3	5620 A1
2418 C3	2758 F5	3461 A4	3652 C3	3971 F3	6103 D9
2419 C5	2759 G6	3462 C2	3653 A1	3972 F3	6105 D9
2420 C3	2760 F6	3463 C1	3701 G4	3991 E1	6106 C9
2421 B6	2761 F3	3464 C3	3702 G3	3992 E1	6107 E8
2422 B6	2762 G6	3465 C2	3703 G6	3993 E1	6108 B9
2423 B5	2763 G6	3466 A5	3704 G5	3994 E1	6109 B9
2425 C4	2765 G4	3467 A5	3708 G5	3995 E2	6111 E8
2426 C4	2766 F7	3468 A4	3710 G4	3996 E2	6120 E9
2429 C5	2767 G4	3469 A5	3711 G4	3997 E2	6121 E9
2430 C6	2768 G6	3475 A5	3712 F4	3998 E10	6122 E9
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2434 B5	2782 F4	3485 D2	3716 G4	4401 C1	6203 G1
2435 C4	2783 F6	3486 D2	3717 G4	4402 C1	6204 G1
2443 C1	2784 G5	3487 D2	3718 G5	4403 A1	6205 G1
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2445 D1	2786 G5	3489 B1	3721 F4	4405 D2	6406 D4
2446 C1	2787 F5	3490 D6	3722 F4	4406 A1	6407 D4
2447 C1	2902 D1	3491 D1	3723 F4	4407 A1	6408 D4
2450 A2	2903 D1	3495 C5	3724 F4	4408 B1	6421 D4
2455 D2	2906 D1	3499 C5	3725 F5	4409 C1	6422 D5
2459 A5	2909 E1	3500 A8	3726 F4	4417 D4	6423 C4
2460 A4	2910 E1	3501 A8	3727 F4	4418 C6	6440 D1
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2462 C1	2913 F1	3503 A9	3730 D5	4442 D3	6442 A1
2463 C1	2915 D1	3504 C7	3731 E5	4443 D3	6460 A4
2464 C2	2916 D1	3507 D6	3732 E5	4444 D3	6461 A4
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2466 A6	2919 E1	3509 B9	3734 E5	4483 D2	6463 C1

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6465	C2	9203	F5	9930	E1				
6466	A5	9204	F6	9931	G1				
6468	A4	9205	F6	9932	E2				
6480	C5	9206	F5	9933	E3				
6481	D6	9207	E4	9934	F3				
6482	D2	9208	G2	9935	F2				
6483	C2	9209	E4	9936	E4				
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6502	A7	9212	G2	9945	E5				
6503	A7	9213	E1	9946	F3				
6504	A6	9214	E5	9947	E5				
6505	C6	9215	E4	9948	D4				
6506	C7	9216	F2	9950	D4				
6507	E7	9217	E2	9951	D5				
6508	C7	9218	E1	9952	D4				
6510	B6	9220	E1	9957	F3				
6511	D8	9221	G2	9958	E5				
6512	D8	9222	F6	9960	E3				
6514	D6	9223	F4	9961	F3				
6515	B8	9224	F6	9962	F3				
6516	D7	9225	D1	9963	F5				
6517	D6	9226	F1	9964	F5				
6518	C7	9227	F1	9965	F2				
6520	E7	9228	F1	9966	F5				
6521	E6	9229	G1	9967	D5				
6522	E6	9230	E2	9968	D6				
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6616	B1	9401	B4	9970	F2				
6619	A1	9402	B1	9971	F2				
6620	A1	9403	B1	9972	G1				
6621	A1	9404	B1	9976	D1				
6622	A1	9408	C2	9980	E2				
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7101	C9	9423	C4	9985	G2				
7102	D8	9424	D1	9987	F2				
7103	E9	9425	C5	9988	F2				
7104	E9	9426	C4	9989	E3				
7280	G3	9428	C2	9990	E2				
7407	D3	9429	C4	9991	F4				
7408	D3	9430	C3	9992	F4				
7409	D4	9431	A1	9993	F2				
7421	D3	9466	A5	9994	F2				
7440	C1	9480	C5	9995	F2				
7441	C1	9501	B7	9996	F3				
7442	C1	9502	B7	9997	G2				
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7481	D2	9504	B7	9999	F4				
7482	D2	9505	D8						
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7502	C8	9512	C7						
7504	C7	9513	C7						
7505	C8	9514	C8						
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7510	E6	9517	E7						
7511	E6	9518	C7						
7528	E7	9519	C8						
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7600	C1	9523	D7						
7602	B1	9524	D7						
7603	B1	9525	C7						
7605	C1	9526	A7						
7606	C1	9620	A1						
7610	D1	9622	A1						
7611	D1	9623	B2						
7620	A1	9624	B3						
7640	B1	9705	G7						
7641	C2	9707	G4						
7652	B6	9712	F5						
7701	G6	9713	G4						
7702	F4	9714	G4						
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7711	F5	9718	G4						
7715	F4	9720	G3						
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7722	D5	9723	F5						
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7724	D5	9907	E3						
7725	E5	9908	E3						
7730	G4	9909	E2						
7731	G4	9910	E2						
7732	G4	9911	E2						
7733	G6	9912	E2						
7740	G5	9913	E2						
7750	G4	9914	E3						
7900	E1	9915	E3						
7901	F1	9916	E3						
7905	E3	9917	E3						
7906	F2	9918	E3						
7907	F3	9919	E3						
9001	C9	9922	E2						
9102	D9	9925	F2						
9110	E7	9926	F2						
9115	E7	9927	F3						
9201	G3	9928	F3						

CL96532156_090.eps
030300

Part 2

CL96532156_084.pdf
180200

Part 4

CL96532156_086.pdf
180200

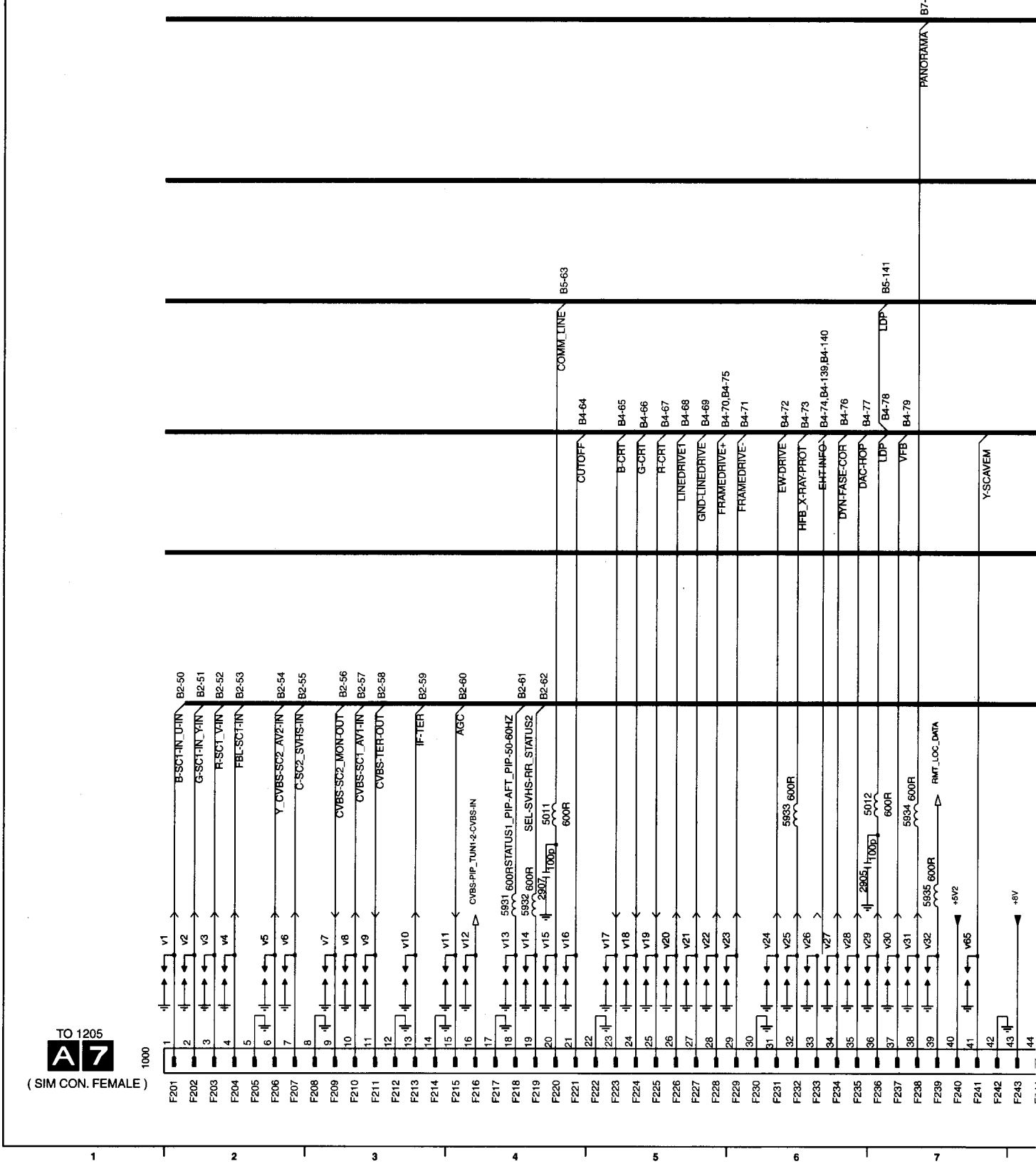
CL96532156_073.eps
030300

Sim connector (male)

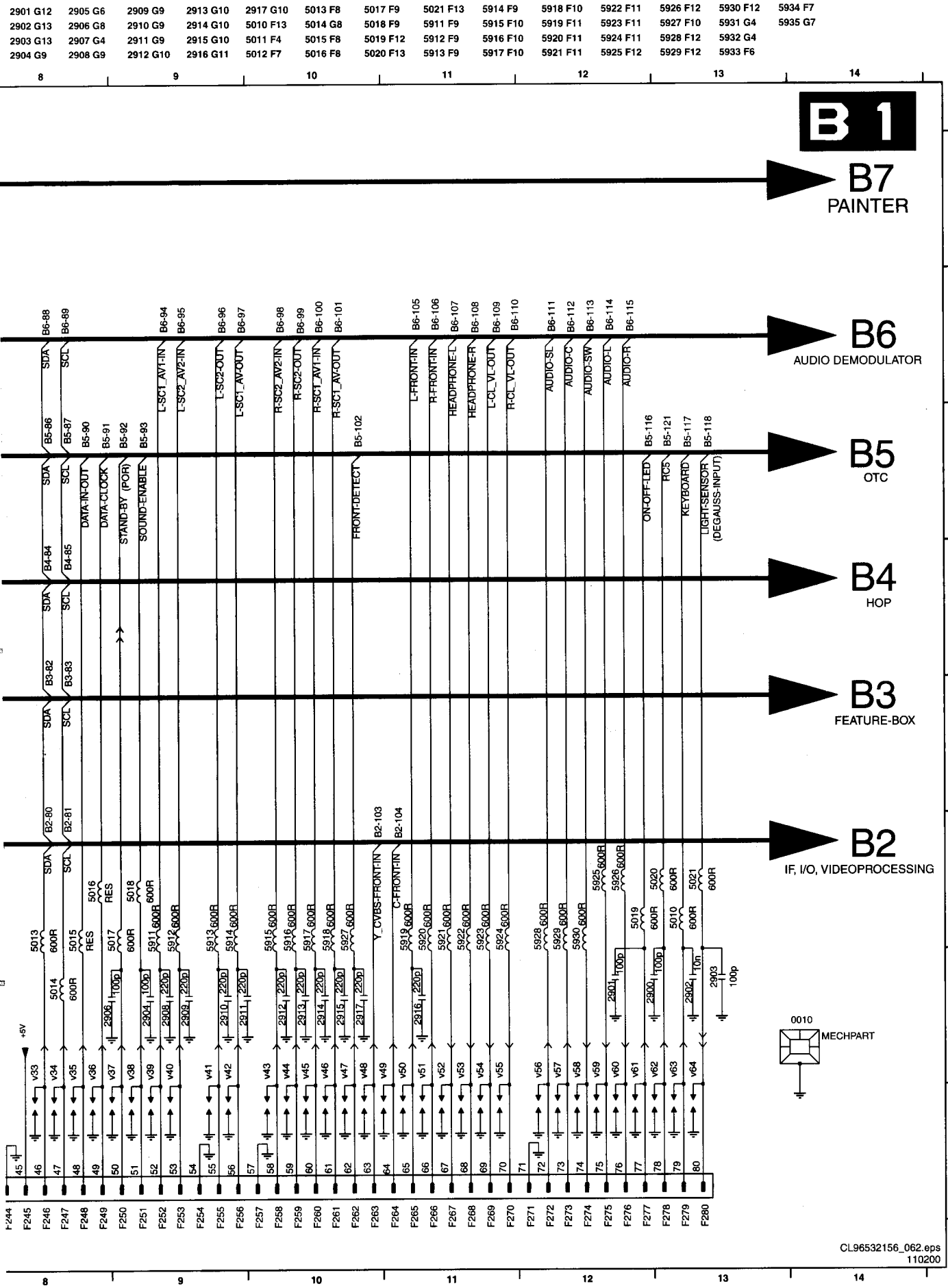
v5 G2	v9 G3	v13 G4	v17 G5	v21 G5	v25 G6	v29 G7	v33 G8	v37 G9	v41 G9	v45 G10	v49 G11	v53 G11	v57 G12	v61 G12	v65 G7
v6 G2	v10 G3	v14 G4	v18 G5	v22 G5	v26 G6	v30 G7	v34 G8	v38 G9	v42 G9	v46 G10	v50 G11	v54 G11	v58 G12	v62 G13	0010 G14
v7 G3	v11 G4	v15 G4	v19 G5	v23 G6	v27 G6	v31 G7	v35 G8	v39 G9	v43 G10	v47 G10	v51 G11	v55 G11	v59 G12	v63 G13	1000 H1
v8 G3	v12 G4	v16 G4	v20 G5	v24 G6	v28 G6	v32 G7	v36 G8	v40 G9	v44 G10	v48 G10	v52 G11	v56 G12	v60 G12	v64 G13	2900 G12

1 2 3 4 5 6 7

B 1 SIM CONNECTOR (MALE)

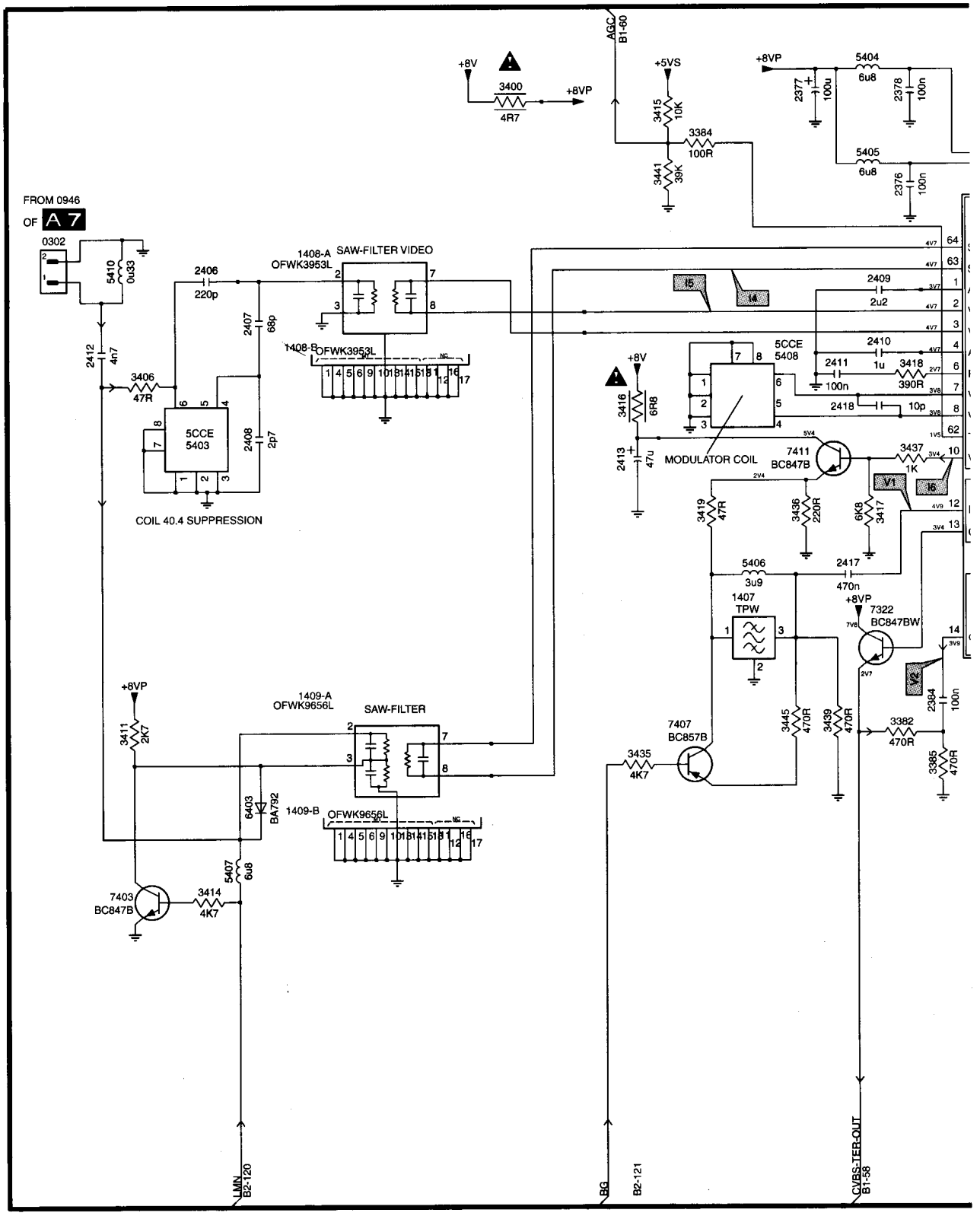


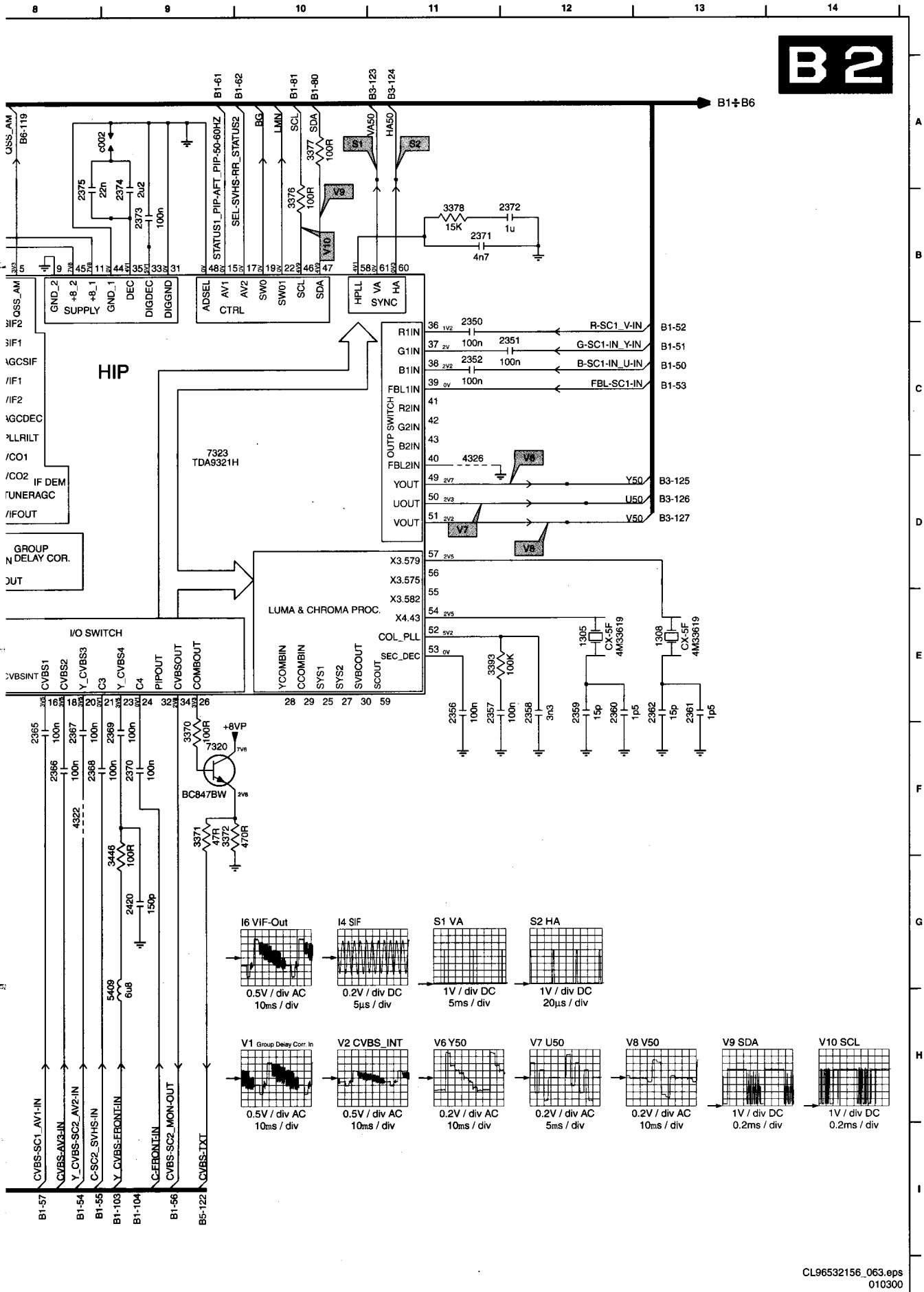
1 2 3 4 5 6 7


2901 G12 2905 G6 2909 G9 2913 G10 2917 G10 5013 F8 5017 F9 5021 F13 5914 F9 5918 F10 5922 F11 5926 F12 5930 F12 5934 F7
2902 G13 2906 G8 2910 G9 2914 G10 5010 F13 5014 G8 5018 F9 5911 F9 5915 F10 5919 F11 5923 F11 5927 F10 5931 G4 5935 G7
2903 G13 2907 G4 2911 G9 2915 G10 5011 F4 5015 F8 5019 F12 5912 F9 5916 F10 5920 F11 5924 F11 5928 F12 5932 G4
2904 G9 2908 G9 2912 G10 2916 G11 5012 F7 5016 F8 5020 F13 5913 F9 5917 F10 5921 F11 5925 F12 5929 F12 5933 F6
B 1
B7
PAINTER
B6
AUDIO DEMODULATOR
B5
OTC
B4
HOP
B3
FEATURE-BOX
B2
IF, I/O, VIDEOPROCESSING
L-SC1_AV1-IN
L-SC2_AV2-IN
L-SC2-OUT
L-SC1_AV-OUT
R-SC2_AV2-IN
R-SC2-OUT
R-SC1_AV1-IN
R-SC1_AV-OUT
L-FRONT-IN
R-FRONT-IN
HEADPHONE-L
HEADPHONE-R
L-CL_VL-OUT
R-CL_VL-OUT
AUDIO-SL
AUDIO-C
AUDIO-SW
AUDIO-L
AUDIO-R
DATA-IN-OUT
DATA-CLOCK
STAND-BY (POR)
SOUND-ENABLE
FRONT-DETECT
ON-OFF-LED
RC5
KEYBOARD
LIGHT-SENSOR (DEGAUSS-INPUT)
SDA
SCL
Y_CVBS-FRONT-IN
C-FRONT-IN
+5V
RES
600R
100p
220p
0010
MECHPART
CL96532156_062.eps
110200

IF, I/O videoprocessing

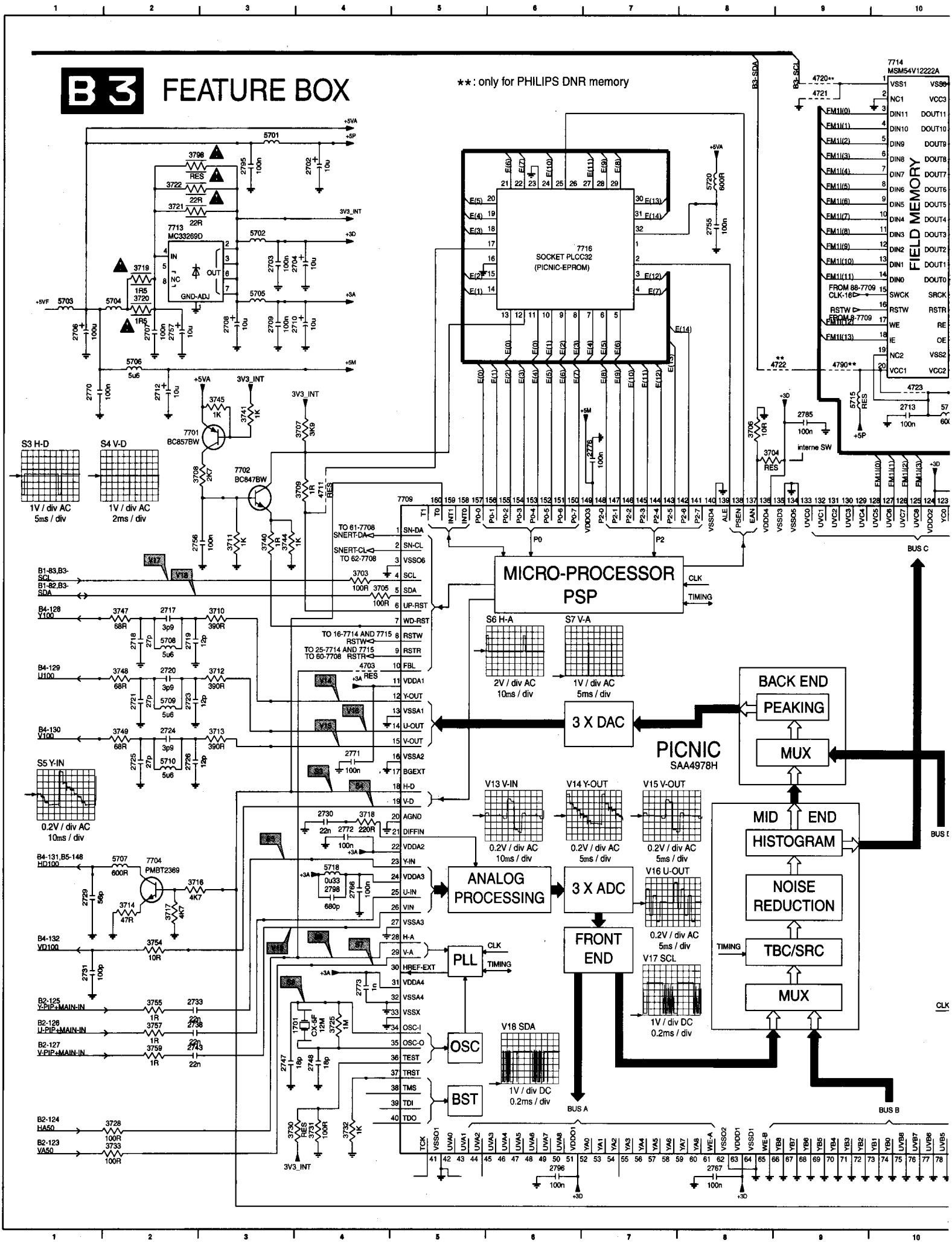
B 2 IF,I/O VIDEOPROCESSING

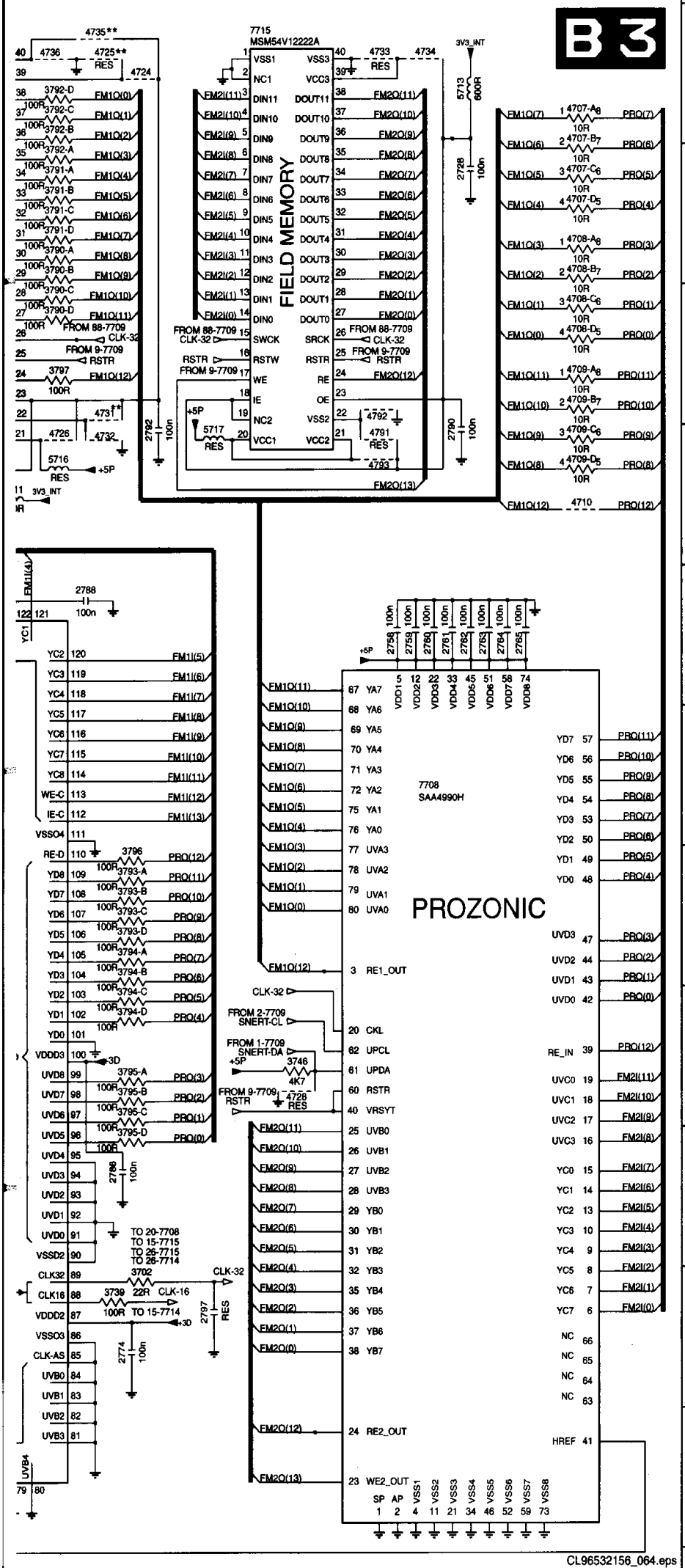




0302 B1
1305 E12
1308 E13
1407 E6
1408-A B3
1408-B C3
1409-A E3
1409-B F3
2350 C11
2351 C12
2352 C11
2356 E11
2357 E11
2358 E12
2359 E12
2360 E12
2361 E13
2362 E13
2365 F8
2366 F8
2367 F8
2368 F8
2369 F9
2370 F9
2371 B11
2372 B12
2373 B9
2374 A9
2375 A8
2376 B7
2377 A7
2378 A7
2384 F8
2406 C3
2407 C3
2408 D3
2409 C7
2410 C7
2411 C7
2412 C2
2413 D5
2417 E7
2418 D7
2420 G9
3370 F9
3371 F9
3372 F9
3376 B10
3377 A10
3378 B11
3382 F7
3384 B6
3385 F8
3393 E11
3400 A5
3406 C2
3411 F2
3414 G3
3415 B6
3416 D5
3417 D7
3418 C7
3419 D6
3435 F6
3436 D7
3437 D7
3439 F7
3441 B6
3445 F7
3446 F9
4322 F8
4326 D11
5403 D2
5404 A7
5405 B7
5406 E6
5407 G3
5408 C6
5409 G9
5410 C2
6403 F3
7320 F9
7322 E7
7323 C9
7403 G2
7407 F6
7411 D7
c002 A9

Feature box


B3 FEATURE BOX
**: only for PHILIPS DNR memory
MICRO-PROCESSOR PSP
PICNIC SAA4978H
3 X DAC
3 X ADC
ANALOG PROCESSING
FRONT END
BACK END
PEAKING
MUX
MID END
HISTOGRAM
NOISE REDUCTION
TBC/SRC
MUX
PLL
OSC
BST
FIELD MEMORY
MSM54V12222A
SOCKET PLCC32 (PICNIC-EPROM)
MC33269D
BC857BW
BC847BW
PMBT2369
S3 H-D
1V / div AC
5ms / div
S4 V-D
1V / div AC
2ms / div
S5 Y-IN
0.2V / div AC
10ms / div
S6 H-A
2V / div AC
10ms / div
S7 V-A
1V / div AC
5ms / div
V13 V-IN
0.2V / div AC
10ms / div
V14 Y-OUT
0.2V / div AC
5ms / div
V15 V-OUT
0.2V / div AC
5ms / div
V16 U-OUT
0.2V / div AC
5ms / div
V17 SCL
1V / div DC
0.2ms / div
V18 SDA
1V / div DC
0.2ms / div
BUS A
BUS B
BUS C
TO 61-7708 SNERT-DA
SNERT-CL TO 62-7708
TO 16-7714 AND 7715 RSTW
TO 25-7714 AND 7715 TO 60-7708 RSTR
interne SW
FROM 88-7709 CLK-16
FROM 8-7709



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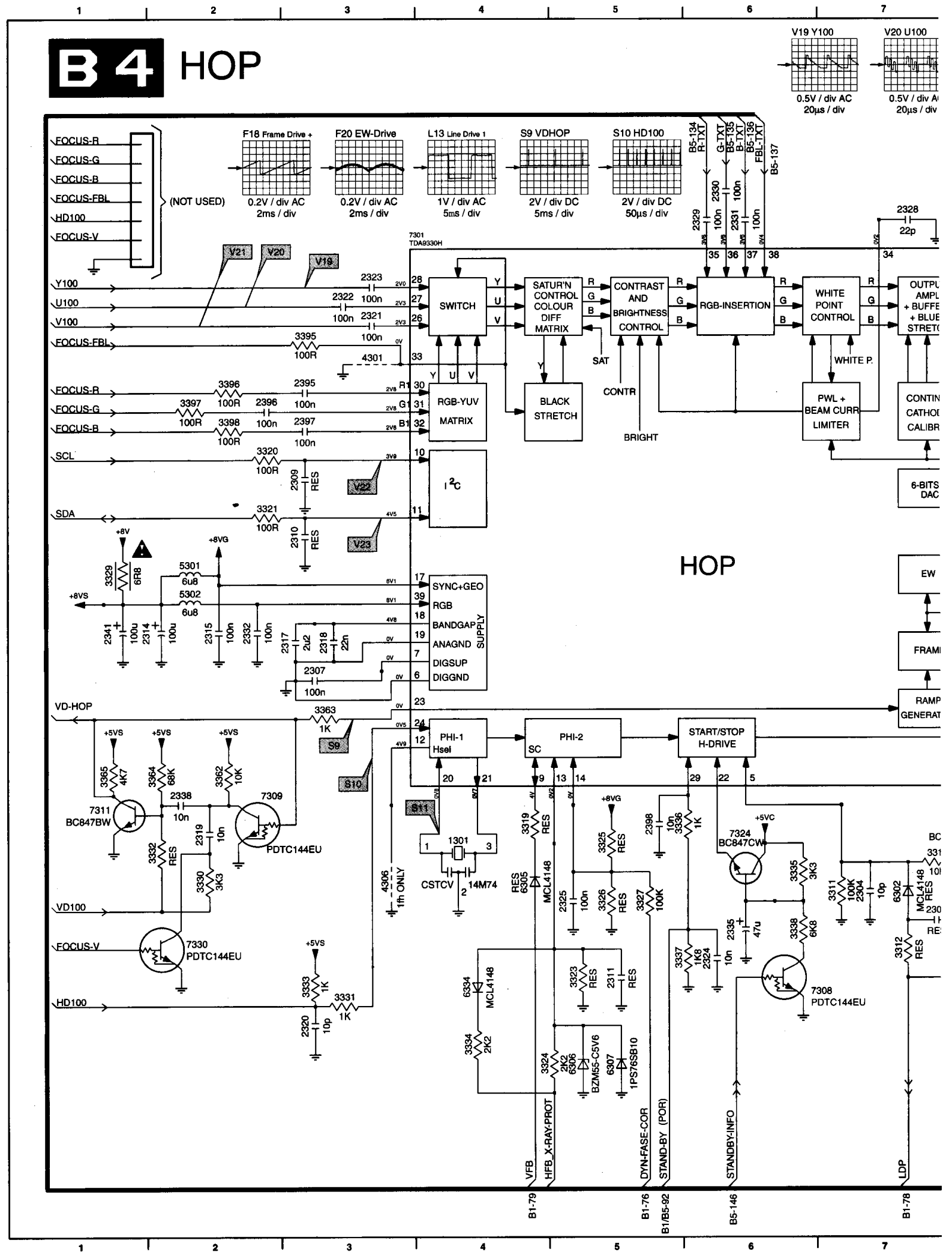
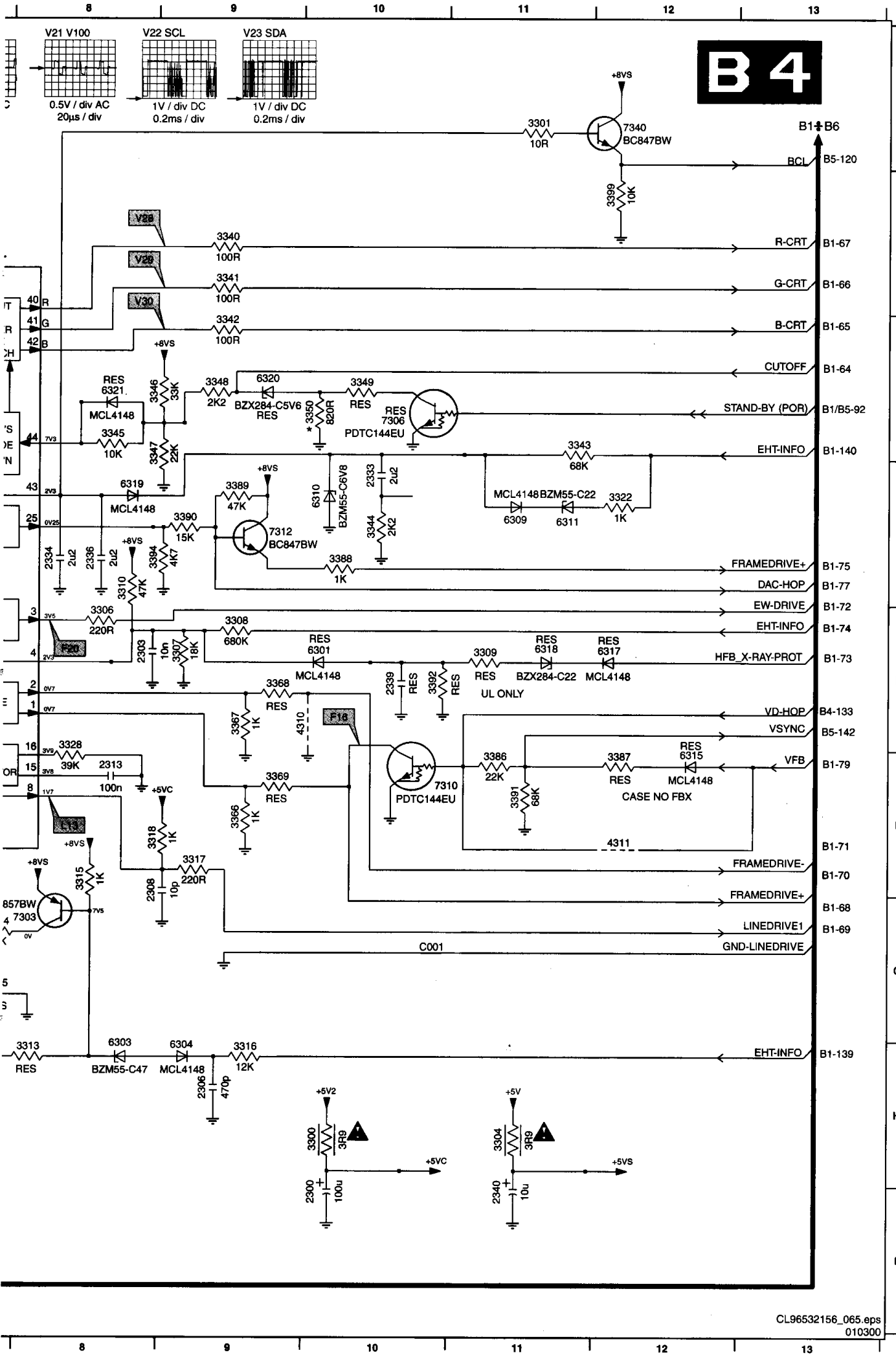
2704 C4	3793-D G11
2706 C1	3794-A G11
2707 C2	3794-B G11
2708 C3	3794-C H11
2709 C3	3794-D H11
A 2710 C4	3795-A H11
2712 D2	3795-B H11
2713 D10	3795-C H11
2717 F2	3795-D I11
2718 F2	3796 G11
2719 F2	3797 C11
2720 F2	3798 B2
2721 G2	4703 F4
2723 G2	4707-A A15
B 2724 G2	4707-B A15
2725 G2	4707-C B15
2726 G2	4707-D B15
2728 B14	4708-A B15
2729 I1	4708-B B15
2730 H4	4708-C C15
2731 I1	4708-D C15
2733 J2	4709-A C15
2738 J2	4709-B C15
C 2743 J2	4709-C D15
2747 J3	4709-D D15
2748 J4	4710 D15
2755 B8	4711 E4
2756 E2	4720 A9
2757 C2	4721 A9
2758 E13	4722 D9
2759 E13	4723 D10
2760 E14	4724 A11
2761 E14	4725 A11
D 2762 E14	4726 D11
2763 E14	4728 H13
2764 E14	4731 C11
2765 E14	4732 D11
2766 I4	4733 A13
2767 K8	4734 A14
2770 D1	4735 A11
2771 G4	4736 A11
2772 H4	4790 D9
E 2773 I4	4791 D13
2774 J11	4792 C13
2776 D7	4793 D13
2785 D9	5701 A3
2786 I11	5702 B3
2788 E11	5703 C1
2790 D14	5704 C2
2792 D11	5705 C3
2795 B3	5706 D2
F 2796 K6	5707 H2
2797 J12	5708 F2
2798 I4	5709 G2
3702 J11	5710 G2
3703 F4	5711 D10
3704 D8	5713 A14
3705 F4	5715 D9
3706 D8	5716 D11
3707 D4	5717 D12
G 3708 E2	5718 H4
3709 E4	5720 B8
3710 F3	7701 D2
3711 E3	7702 E3
3712 F3	7704 H2
3713 G3	7708 F13
3714 I2	7709 E5
3716 H2	7713 B2
3717 I2	7714 A10
3718 H4	7715 A12
H 3719 C2	7716 B7
3720 C2	
3721 B2	
3722 B2	
3725 J4	
3726 K2	
3730 K3	
3731 K4	
3732 K4	
I 3733 K2	
3739 J11	
3740 E3	
3741 D3	
3744 E3	
3745 D3	
3746 H13	
3747 F2	
3748 F2	
3749 G2	
J 3754 I2	
3755 J2	
3757 J2	
3759 J2	
3790-A B11	
3790-B B11	
3790-C C11	
3790-D C11	
3791-A B11	
K 3791-B B11	
3791-C B11	
3791-D B11	
3792-A B11	
3792-B A11	
3792-C A11	
3792-D A11	

Diversity Small Signal Panel (B3)

Item	100HZ INCR ST	DS VIRT DLB	100HZ DLB
2728	-	100N	-
2758	-	100N	-
2759	-	100N	-
2760	-	100N	-
2761	-	100N	-
2762	-	100N	-
2763	-	100N	-
2764	-	100N	-
2765	-	100N	-
2790	-	100N	-
3793	10R	100R	10R
3794	10R	100R	10R
3795	10R	100R	10R
3796	10R	100R	10R
4707	10R	-	10R
4708	10R	-	10R
4709	10R	-	10R
4710	JUMP	-	JUMP
4734	-	JUMP	-
4792	-	JUMP	-
4793	-	JUMP	-
5713	-	FXDIND	-
7708	-	SAA4990H	-
7715	-	MSM54V12222A-30JS	-

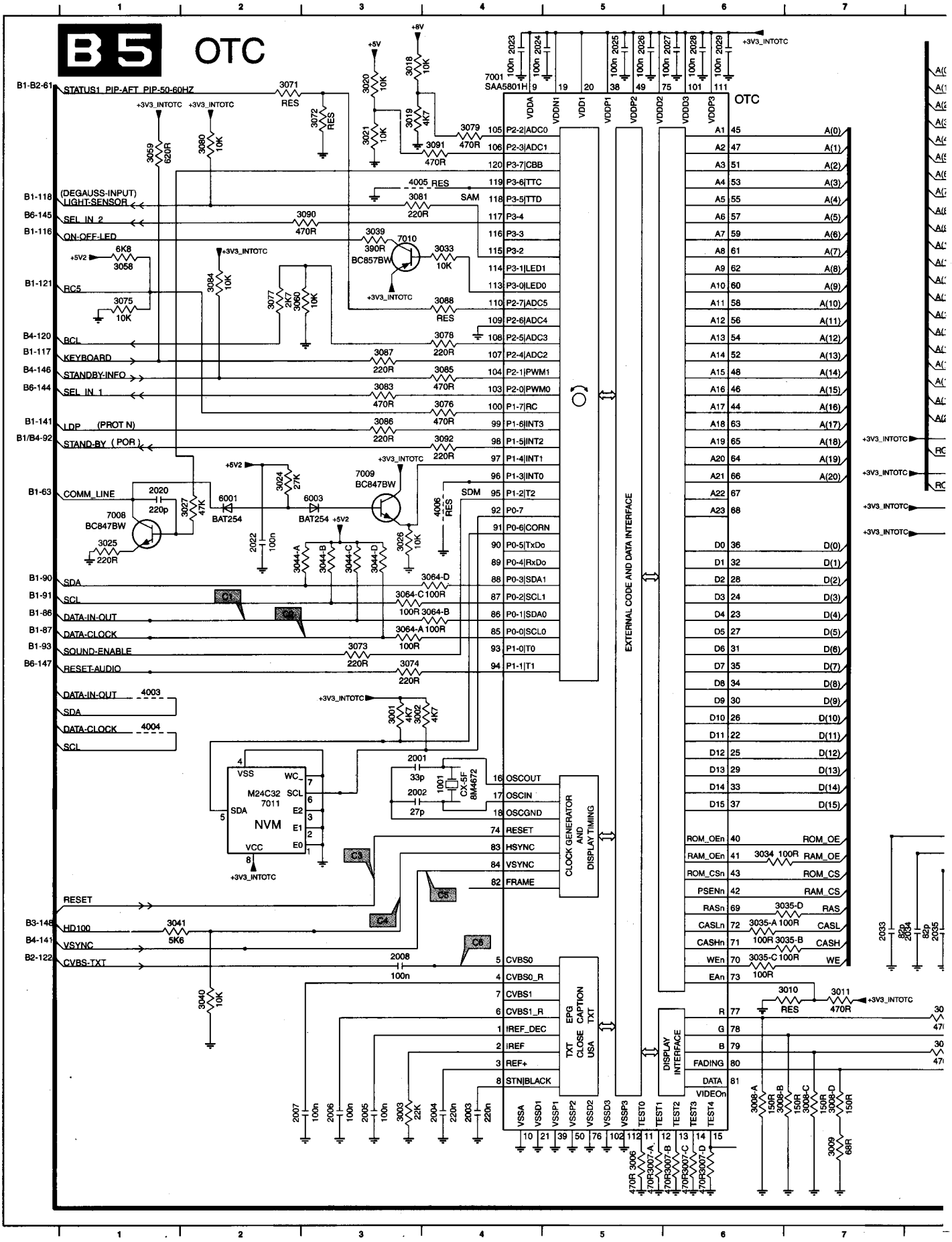
HOP

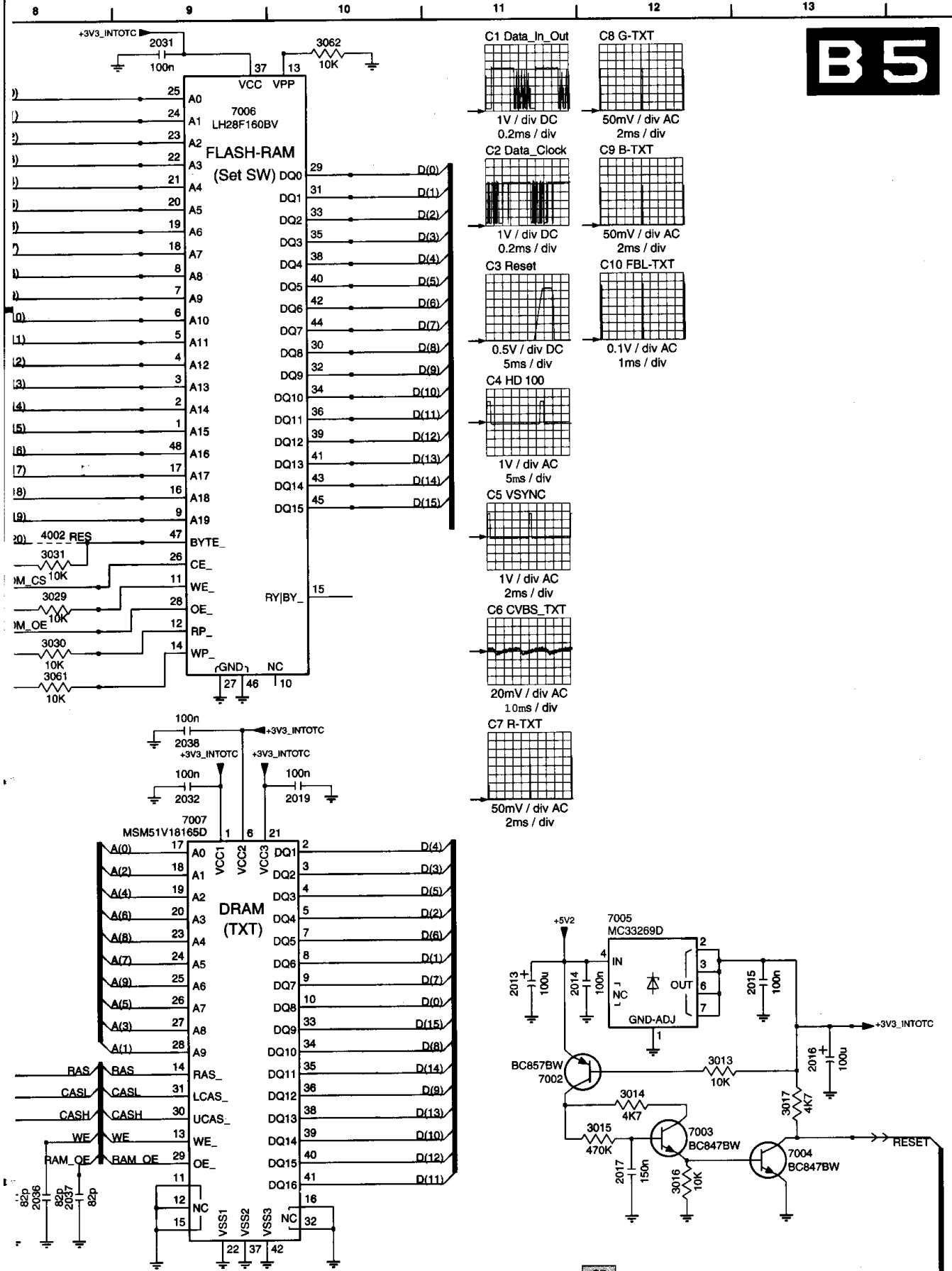

B 4 HOP
V19 Y100
0.5V / div AC
20µs / div
V20 U100
0.5V / div AC
20µs / div
F18 Frame Drive +
0.2V / div AC
2ms / div
F20 EW-Drive
0.2V / div AC
2ms / div
L13 Line Drive 1
1V / div AC
5ms / div
S9 VDHOP
2V / div DC
5ms / div
S10 HD100
2V / div DC
50µs / div
FOCUS-R
FOCUS-G
FOCUS-B
FOCUS-FBL
HD100
FOCUS-V
(NOT USED)
7301
TDA9330H
SWITCH
SATUR'N CONTROL COLOUR DIFF MATRIX
CONTRAST AND BRIGHTNESS CONTROL
RGB-INSERTION
WHITE POINT CONTROL
RGB-YUV MATRIX
BLACK STRETCH
PWL + BEAM CURR LIMITER
I²C
SYNC+GEO
RGB
BANDGAP
ANAGND
DIGSUP
DIGGND
SUPPLY
PHI-1
Hsel
PHI-2
SC
START/STOP H-DRIVE
HOP
VD-HOP
VD100
HD100
7311 BC847BW
7309 PDTC144EU
7330 PDTC144EU
7324 BC847CW
7308 PDTC144EU
MCL4148
BZM55-C5V6
1PS76SB10
CSTCV 14M74
VFB
HFB_X-RAY-PROT
DYN-FASE-COR
STAND-BY (POR)
STANDBY-INFO
LDP
B1-79
B1-76
B1/B5-92
B5-146
B1-78



	1301 G4	3349 C10
	2300 I10	3350 C10
	2303 E8	3362 F2
	2304 G7	3363 F3
	2305 G7	3364 F2
A	2306 H9	3365 F1
	2307 E3	3366 F9
	2308 F8	3367 E9
	2309 D3	3368 E9
	2310 D3	3369 F9
	2311 H5	3386 F11
	2313 F8	3387 F12
	2314 E2	3388 D10
	2315 E2	3389 D9
	2317 E3	3390 D9
B	2318 E3	3391 F11
	2319 G2	3392 E10
	2320 H3	3394 D8
	2321 C3	3395 C3
	2322 C3	3396 C2
	2323 B3	3397 C2
	2324 G6	3398 C2
	2325 G5	3399 B12
	2328 B7	4301 C3
C	2329 B6	4306 G3
	2330 B6	4310 E10
	2331 B6	4311 F12
	2332 E2	5301 E2
	2333 D10	5302 E2
	2334 D8	6301 E10
	2335 G6	6302 G7
	2336 D8	6303 H8
	2338 F2	6304 H9
	2339 E10	6305 G4
D	2340 I11	6306 H5
	2341 E1	6307 H5
	2395 C3	6309 D11
	2396 C2	6310 D10
	2397 C3	6311 D11
	2398 F5	6315 F12
	3300 H10	6317 E12
	3301 A11	6318 E11
	3304 H11	6319 D8
E	3306 E8	6320 C9
	3307 E9	6321 C8
	3308 E9	6334 H4
	3309 E11	7301 B3
	3310 D8	7303 G8
	3311 G7	7306 C10
	3312 G7	7308 H6
	3313 H8	7309 F3
	3314 G7	7310 F11
F	3315 F8	7311 F1
	3316 H9	7312 D9
	3317 F9	7324 G6
	3318 F8	7330 G2
	3319 F4	7340 A12
	3320 D2	C001 G10
	3321 D2	
	3322 D12	
	3323 H5	
G	3324 H4	
	3325 G5	
	3326 G5	
	3327 G5	
	3328 E8	
	3329 E1	
	3330 G2	
	3331 H3	
	3332 G2	
	3333 H3	
H	3334 H4	
	3335 G6	
	3336 F5	
	3337 G5	
	3338 G6	
	3340 B9	
	3341 B9	
	3342 C9	
	3343 C11	
I	3344 D10	
	3345 C8	
	3346 C8	
	3347 C8	
	3348 C9	

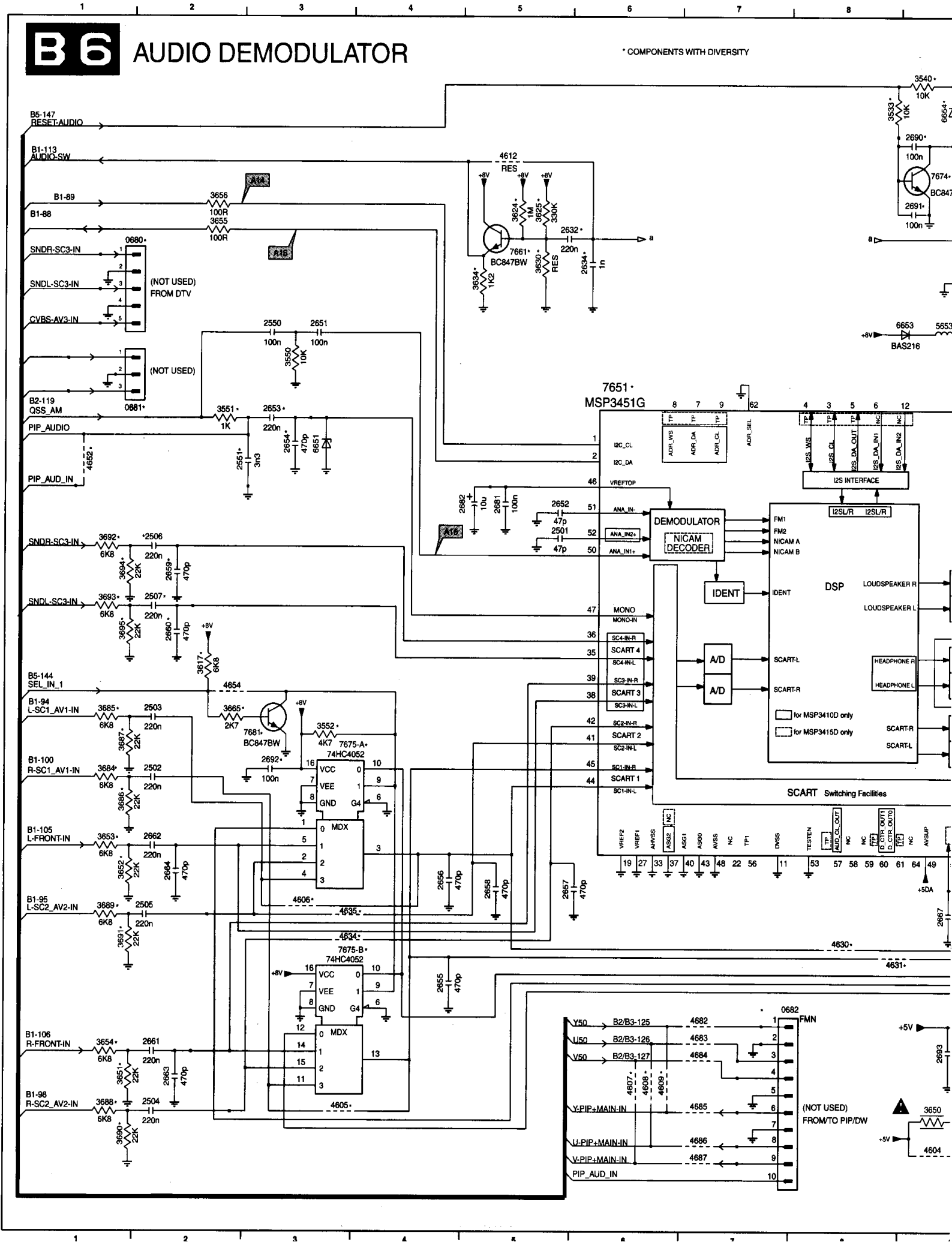
OTC

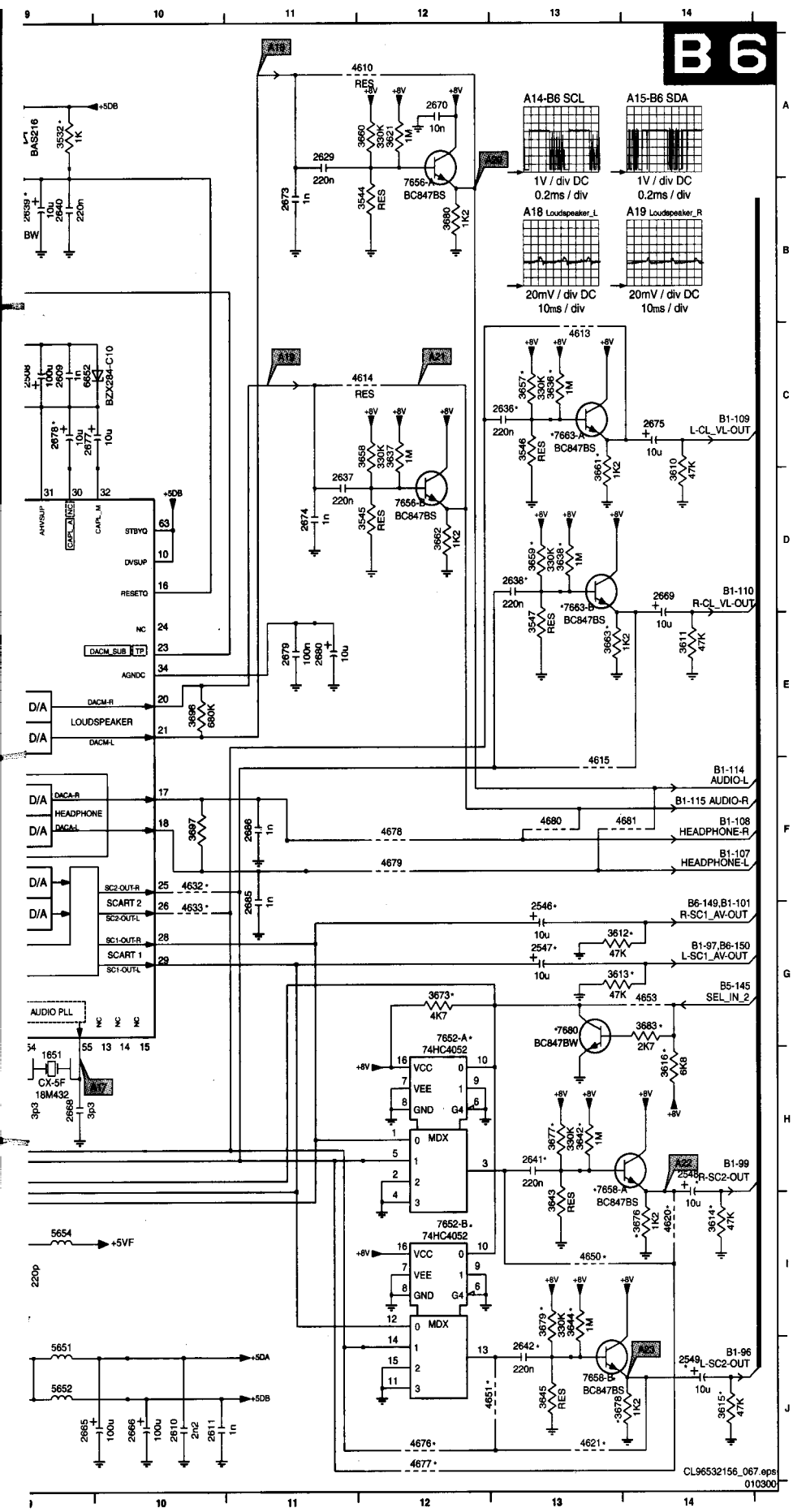

B5
OTC
7001
SAA5801H
OTC
EXTERNAL CODE AND DATA INTERFACE
CLOCK GENERATOR AND DISPLAY TIMING
DISPLAY INTERFACE
EPG CAPTION TXT
TXT CLOSE USA
M24C32
NVM
CX-5F 8M4672
BC847BW
BC857BW
BAT254
STATUS1_PIP-AFT_PIP-50-60HZ
(DEGAUSS-INPUT)
LIGHT-SENSOR
SEL_IN_2
ON-OFF-LED
RC5
BCL
KEYBOARD
STANDBY-INFO
SEL_IN_1
LDP (PROT N)
STAND-BY (POR)
COMM_LINE
SDA
SCL
DATA-IN-OUT
DATA-CLOCK
SOUND-ENABLE
RESET-AUDIO
HD100
VSYNC
CVBS-TXT
RESET
SAM
SDM
+3V3_INTOTC
+5V2
+8V
+5V



	1001 G4	3072 A3	
	2001 G3	3073 F3	
	2002 G3	3074 F3	
	2003 J4	3075 C1	
	2004 J4	3076 D4	
A	2005 J3	3077 C2	
	2006 J3	3078 C4	
	2007 J2	3079 A4	
	2008 H3	3080 B2	
	2009 I8	3081 B3	
	2010 I9	3083 D3	
	2011 I9	3084 C2	
	2012 I9	3085 C4	
	2013 G11	3086 D3	
B	2014 G11	3087 C3	
	2015 G13	3088 C4	
	2016 G13	3090 B3	
	2017 H12	3091 B4	
	2019 E10	3092 D4	
	2020 D1	4002 D8	
	2022 E2	4003 F1	
	2023 A4	4004 F1	
	2024 A4	4005 B3	
	2025 A5	4006 E4	
C	2026 A5	6001 E2	
	2027 A6	6003 E3	
	2028 A6	7001 A4	
	2029 A6	7002 G11	
	2031 A9	7003 H12	
	2032 E9	7004 H13	
	2033 H7	7005 F12	
	2034 H8	7006 A9	
	2035 H8	7007 F9	
D	2036 H8	7008 E1	
	2037 H8	7009 D3	
	2038 E9	7010 B3	
	3001 F3	7011 G2	
	3002 F3		
	3003 J3		
	3006 J5		
	3007-A J5		
	3007-B J6		
E	3007-C J6		
	3007-D J6		
	3008-A I6		
	3008-B I6		
	3008-C I7		
	3008-D I7		
	3009 J7		
	3010 I7		
	3011 I7		
	3012 I8		
F	3013 G12		
	3014 G12		
	3015 H12		
	3016 H12		
	3017 G13		
	3018 A3		
	3019 A3		
	3020 A3		
	3021 A3		
G	3023 I8		
	3024 D2		
	3025 E1		
	3026 E3		
	3027 E2		
	3028 I8		
	3029 D8		
	3030 E8		
	3031 D8		
	3032 I8		
H	3033 B4		
	3034 G6		
	3035-A H6		
	3035-B H7		
	3035-C H6		
	3035-D H7		
	3039 B3		
	3040 I2		
	3041 H1		
I	3044-A E2		
	3044-B E3		
	3044-C E3		
	3044-D E3		
	3058 C1		
	3059 B1		
	3060 C2		
	3061 E8		
	3062 A10		
J	3064-A F3		
	3064-B E4		
	3064-C E3		
	3064-D E4		
	3071 A2		

Audio demodulator



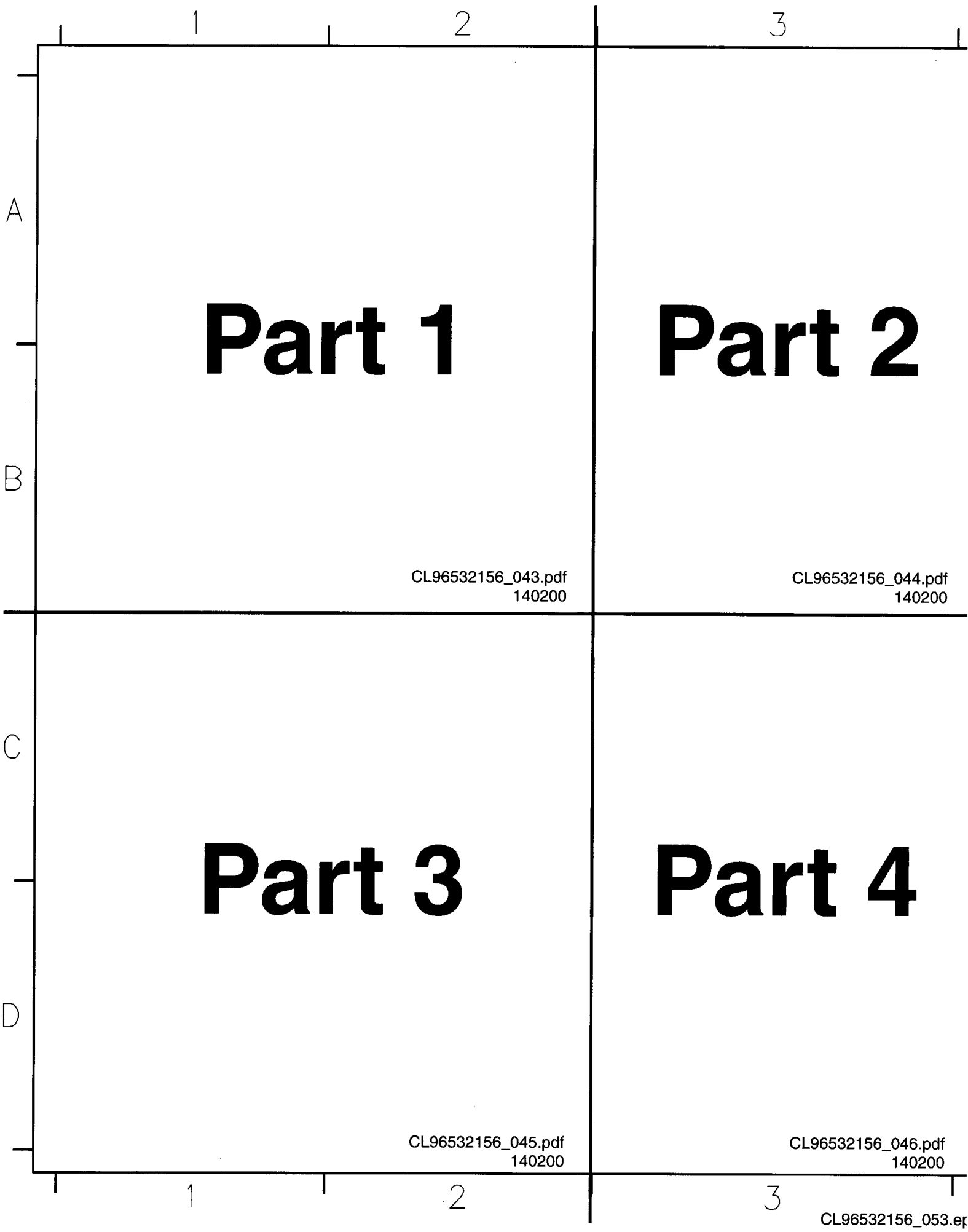


	0680 B1	3645 J13	7681 F3
	0681 D1	3650 J9	
	0682 I7	3651 I1	
	1651 H9	3652 H1	
	2501 E5	3653 G1	
	2502 G2	3654 I1	
A	2503 F2	3655 B2	
	2504 J2	3656 B2	
	2505 H2	3657 C13	
	2506 E2	3658 C12	
	2507 E2	3659 D13	
	2508 C9	3660 A12	
	2546 G13	3661 C13	
	2547 G13	3662 D12	
	2548 H14	3663 E13	
B	2549 J14	3665 F2	
	2550 C3	3673 G12	
	2551 D2	3676 I14	
	2609 C9	3677 H13	
	2610 J10	3678 J13	
	2611 J10	3679 I13	
	2629 A11	3680 B12	
	2632 B5	3683 G14	
	2634 B6	3684 G1	
	2636 C13	3685 F1	
C	2637 D11	3686 G1	
	2638 D13	3687 F1	
	2639 B9	3688 J1	
	2640 B9	3689 H1	
	2641 H13	3690 J1	
	2642 J13	3691 H1	
	2651 C3	3692 E1	
	2652 E5	3693 E1	
	2653 D3	3694 E1	
D	2654 D3	3695 F1	
	2655 H4	3696 E10	
	2656 H4	3697 F10	
	2657 H5	4604 J9	
	2658 H5	4605 J3	
	2659 E2	4606 H3	
	2660 F2	4607 I6	
	2661 I2	4608 I6	
	2662 G2	4609 I6	
E	2663 I2	4610 A12	
	2664 H2	4612 B5	
	2665 J9	4613 B13	
	2666 J10	4614 C12	
	2667 H9	4615 F13	
	2668 H9	4620 I14	
	2669 D14	4621 J13	
	2670 A12	4630 H8	
	2673 B11	4631 H8	
F	2674 D11	4632 F10	
	2675 C14	4633 G10	
	2677 C9	4634 H3	
	2678 C9	4635 H3	
	2679 E11	4650 I13	
	2680 E11	4651 J13	
	2681 D5	4652 D1	
	2682 D5	4653 G14	
	2685 F11	4654 F2	
	2686 F11	4676 J12	
G	2690 A9	4677 J12	
	2691 B9	4678 F12	
	2692 G3	4679 F12	
	2693 I9	4680 F13	
	3532 A9	4681 F14	
	3533 A8	4682 I7	
	3540 A9	4683 I7	
	3544 B12	4684 I7	
	3545 D12	4685 J7	
H	3546 C13	4686 J7	
	3547 E13	4687 J7	
	3550 C3	5651 J9	
	3551 D2	5652 J9	
	3552 F3	5653 C9	
	3610 C14	5654 I9	
	3611 E14	6651 D3	
	3612 G13	6652 C9	
	3613 G13	6653 C9	
	3614 I14	6654 A9	
I	3615 J14	7651 D6	
	3616 H14	7652-A G12	
	3617 F2	7652-B I12	
	3621 A12	7656-A B12	
	3624 B5	7656-B D12	
	3625 B5	7658-A I13	
	3630 B5	7658-B J13	
	3634 C5	7661 B5	
	3636 C13	7663-A C13	
J	3637 C12	7663-B D13	
	3638 D13	7674 B9	
	3642 H13	7675-A G4	
	3643 I13	7675-B H4	
	3644 I13	7680 G13	

Diversity Small Signal Panel (B6)

Item	100HZ INCR ST	DS VIRT DLB	100HZ DLB
2636	220N	-	-
2638	220N	-	-
2641	220N	-	-
2642	220N	-	-
2663	-	470P	470P
2664	-	470P	470P
2677	2U2	10U	10U
2678	-	10U	10U
2678	-	10U	10U
2685	-	1N	1N
2686	-	1N	1N
2692	100N	-	-
3552	4K7	-	-
3617	6K8	-	-
3636	1M	-	-
3638	1M	-	-
3642	1M	-	-
3644	1M	-	-
3657	330K	-	-
3659	330K	-	-
3661	1K2	-	-
3663	1K2	-	-
3665	2K7	-	-
3676	1K2	-	-
3677	330K	-	-
3678	1K2	-	-
3679	330K	-	-
4605	-	JUMP	JUMP
4606	-	JUMP	JUMP
4613	-	JUMP	JUMP
4615	-	JUMP	JUMP
4620	-	JUMP	JUMP
4621	-	JUMP	JUMP
4630	JUMP	-	-
4631	JUMP	-	-
4632	-	JUMP	JUMP
4633	-	JUMP	JUMP
4634	-	JUMP	JUMP
4635	-	JUMP	JUMP
4650	-	JUMP	JUMP
4651	-	JUMP	JUMP
4678	-	JUMP	JUMP
4679	-	JUMP	JUMP
4680	JUMP	-	-
4681	JUMP	-	-
7651	MSP3415D-FH-B3	MSP3451G-FH-A1	MSP3451G-FH-A1
7658	BC847BS	-	-
7663	BC847BS	-	-
7675	74HC4052PW	-	-
7681	BC847BW	-	-

SSP (LOT side overview)



1000 B1	2743 C3	3657 D2	5918 C1
1001 B3	2757 C3	3659 D1	5919 C1
1305 A2	2765 D3	3661 D1	5920 D1
1308 A2	2767 C3	3663 D1	5921 D1
1407 A1	2771 C3	3665 C2	5922 D1
1409 A2	2772 C3	3676 D2	5923 D1
2001 A3	2773 C3	3677 D1	5924 D1
2002 A3	2774 D3	3678 D2	5925 D1
2004 B3	2776 C3	3679 D1	5926 D1
2005 B3	2785 C3	3683 C2	5927 C1
2006 B3	2790 D3	3692 C2	5928 D1
2007 B3	2796 C3	3693 C2	5929 D1
2009 B3	2797 D3	3694 C2	5930 D1
2010 B3	2798 C3	3695 C2	5931 A1
2011 B3	3003 B3	3697 D2	5932 B1
2012 B3	3010 B3	3702 D3	5933 B1
2013 A3	3011 B3	3703 C3	5934 A1
2016 A3	3012 B3	3704 C3	5935 B1
2019 A3	3018 B3	3705 C3	6001 B3
2020 B3	3019 B3	3706 C3	6003 B3
2023 B3	3020 B3	3714 C2	6403 A2
2025 A3	3021 B3	3716 C2	6652 D2
2026 B3	3023 B3	3717 C2	6653 D2
2027 B3	3024 B3	3728 C3	6654 D2
2028 A3	3025 B3	3733 C3	7001 B3
2029 B3	3026 B3	3739 D3	7007 A3
2032 A3	3027 B3	3755 C3	7008 B3
2033 A3	3028 B3	3757 C3	7009 B3
2034 A3	3029 A3	3759 C3	7010 B3
2035 A3	3032 B3	3790 D3	7323 A2
2036 A3	3033 B3	3791 D3	7340 B2
2037 A3	3034 A3	3792 D3	7403 A2
2300 B1	3035 A3	3797 D3	7658 D2
2314 B1	3039 B3	4311 B1	7663 D1
2315 B2	3041 B3	4322 A1	7674 D2
2317 B2	3058 B3	4326 B2	7675 C2
2318 B2	3059 B3	4605 C2	7680 C2
2332 B2	3062 A3	4606 C2	7681 C2
2335 B2	3071 B3	4607 C2	7704 C3
2336 B2	3072 B3	4608 C2	7709 C3
2340 B2	3073 B3	4609 C2	7714 D3
2341 B2	3074 B3	4613 D2	7715 D3
2350 B1	3075 B3	4615 D1	
2351 B1	3076 B3	4632 D2	
2352 B1	3078 B3	4633 D2	
2356 B2	3079 B3	4653 C2	
2357 B2	3080 B3	4654 C2	
2358 A2	3081 B3	4678 D2	
2365 A1	3083 B3	4679 D2	
2367 A1	3084 B3	4682 C2	
2368 A1	3085 B3	4683 C2	
2376 B2	3086 B3	4684 C2	
2377 B2	3087 B3	4685 C2	
2398 B2	3088 B3	4686 C2	
2406 A2	3090 B3	4687 C2	
2407 A2	3091 B3	4720 D3	
2408 A2	3092 B3	4721 D3	
2409 A2	3300 B1	4722 B3	
2410 A2	3301 B2	4723 D3	
2411 A2	3304 B2	4726 D3	
2417 A2	3317 B1	4731 D3	
2418 A2	3318 B2	4732 D3	
2501 D2	3329 B1	4733 D3	
2506 C2	3335 B2	4734 D3	
2507 C2	3338 B2	4791 D3	
2508 D2	3370 A1	4792 D3	
2546 D1	3376 B2	4793 D3	
2547 C1	3377 B2	5010 C1	
2548 C1	3393 A2	5011 C1	
2549 C1	3394 B2	5012 B1	
2550 C2	3399 B2	5013 B1	
2609 D2	3400 B2	5014 B1	
2636 D2	3406 A2	5015 C1	
2638 D1	3411 A2	5016 C1	
2639 D2	3414 A2	5017 B1	
2641 D1	3417 A2	5018 C1	
2642 C1	3418 A2	5019 C1	
2651 D2	3437 A2	5020 C1	
2665 D2	3532 D2	5021 B1	
2666 D2	3533 D2	5301 B2	
2669 D1	3540 D2	5302 B2	
2675 D1	3546 D2	5403 A2	
2677 D2	3547 D1	5405 B2	
2678 D2	3550 C2	5407 A2	
2680 D2	3552 C1	5653 D2	
2682 D2	3610 D1	5654 D1	
2690 D2	3611 D1	5702 C2	
2691 D2	3612 D1	5707 C2	
2692 C1	3613 C1	5711 D3	
2693 D1	3614 C1	5713 D3	
2702 D3	3615 C1	5715 D3	
2703 D2	3616 C2	5716 D3	
2704 C3	3617 C2	5717 D3	
2706 C3	3636 D2	5911 C1	
2708 C2	3638 D1	5912 C1	
2709 C3	3642 D2	5913 C1	
2713 D3	3643 D1	5914 C1	
2729 C2	3644 D2	5915 C1	
2733 C3	3645 D1	5916 C1	
2738 C3	3650 D1	5917 C1	

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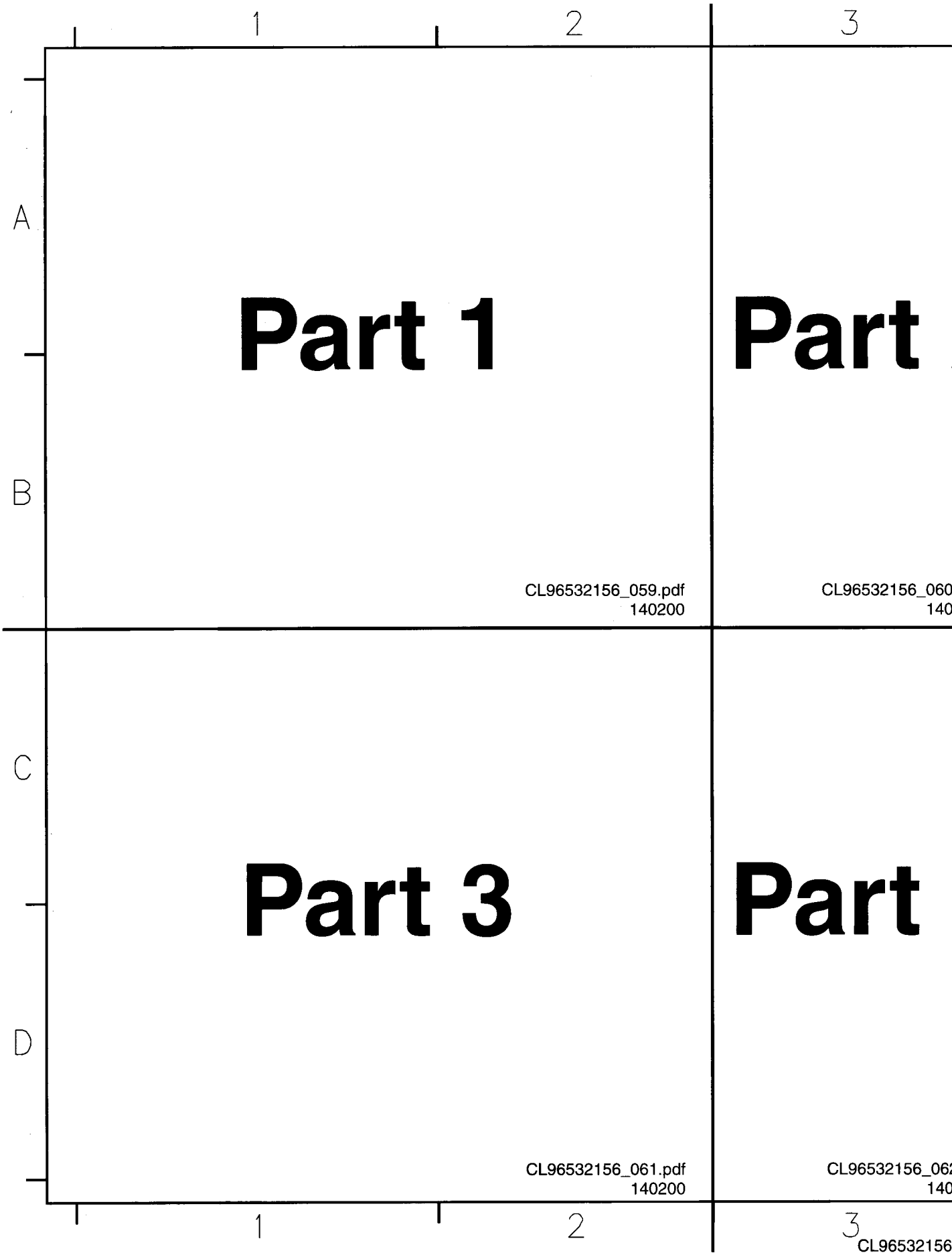
SSP (tuner side overview)



0302 A2	2718 C2	3347 B3	4005 B1
0680 D2	2719 C1	3348 B3	4006 A1
0681 C2	2720 C1	3349 B3	4301 B2
0682 D2	2721 C1	3350 B3	4306 B2
1301 B2	2723 C1	3362 B2	4310 B3
1408 A2	2724 C1	3363 B2	4604 D3
1651 D2	2725 C2	3364 B2	4610 D3
1701 C1	2726 C1	3365 A2	4612 D2
2003 B1	2728 D1	3366 B2	4614 D2
2008 B1	2730 C1	3367 B2	4620 D2
2014 A2	2731 C1	3368 B2	4621 C2
2015 A1	2747 C1	3369 B2	4630 C3
2017 A1	2748 C1	3371 A3	4631 D3
2022 A2	2755 C1	3372 B3	4634 C2
2024 B1	2756 C1	3378 A2	4635 C2
2031 A1	2758 D1	3382 A2	4650 D2
2038 A1	2759 D1	3384 A2	4651 C2
2303 B2	2760 D1	3385 A3	4652 C2
2304 B2	2761 D1	3386 B3	4676 C2
2305 B3	2762 D1	3387 B3	4677 D2
2306 B3	2763 D1	3388 B2	4680 D3
2307 B2	2764 D1	3389 B2	4681 D3
2308 B2	2766 C1	3390 B2	4703 C1
2309 B2	2770 C1	3391 B2	4707 D1
2310 B2	2786 D1	3392 B3	4708 D1
2311 B2	2788 C1	3395 A2	4709 D1
2313 B2	2792 D1	3396 A2	4710 D1
2319 B2	2795 D2	3397 A2	4711 C1
2320 B2	2900 C3	3398 A2	4724 D1
2321 B2	2901 C3	3415 A2	4725 D1
2322 B2	2902 C3	3416 A3	4728 D1
2323 B2	2903 C3	3419 A3	4735 D1
2324 B2	2904 C3	3435 A3	4736 D1
2325 B2	2905 C3	3436 A2	4790 D1
2328 B2	2906 B3	3439 A2	5404 A2
2329 B2	2907 C3	3441 A2	5406 A3
2330 B2	2908 C3	3445 A2	5408 A2
2331 B2	2909 C3	3446 B3	5409 B3
2333 B2	2910 C3	3544 D3	5410 A2
2334 B2	2911 C3	3545 D3	5651 D3
2338 B2	2912 C3	3551 C2	5652 D3
2339 B3	2913 C3	3621 D3	5701 D1
2359 A2	2914 C3	3624 D3	5703 D1
2360 A2	2915 C3	3625 D3	5704 C1
2361 A2	2916 C3	3630 D3	5705 C1
2362 A2	2917 C3	3634 D3	5706 C1
2366 A3	3001 B1	3637 D3	5708 C1
2369 B3	3002 B1	3651 C2	5709 C1
2370 B3	3006 B1	3652 C2	5710 C1
2371 A2	3007 B1	3653 C2	5718 C1
2372 A2	3008 B1	3654 C2	5720 C1
2373 A3	3009 B1	3655 D2	6301 B3
2374 A2	3013 A1	3656 D2	6302 B2
2375 A2	3014 A2	3658 D3	6303 B3
2378 A2	3015 A1	3660 D3	6304 B3
2384 A3	3016 A1	3662 D3	6305 B3
2395 A2	3017 A1	3673 C3	6306 A2
2396 A2	3030 A1	3680 D3	6307 A2
2397 A2	3031 A1	3684 C3	6309 B2
2412 A2	3040 B1	3685 C2	6310 B2
2413 A3	3044 B1	3686 C3	6311 B2
2420 B3	3060 B2	3687 C2	6315 B3
2502 C3	3061 A1	3688 C2	6317 B3
2503 C2	3064 B1	3689 C2	6318 B3
2504 C2	3077 B2	3690 C2	6319 B2
2505 C2	3306 B2	3691 C2	6320 B3
2551 C2	3307 B2	3696 D2	6321 B2
2610 D2	3308 B3	3707 C1	6334 B2
2611 D2	3309 B3	3708 C1	6651 C2
2629 D2	3310 B3	3709 C1	7002 A2
2632 D2	3311 B2	3710 C1	7003 A2
2634 D2	3312 B3	3711 C1	7004 B1
2637 D2	3313 B3	3712 C1	7005 A1
2640 D2	3314 B2	3713 C1	7006 A1
2652 D2	3315 B3	3718 C1	7011 B1
2653 C2	3316 B3	3719 C1	7301 B2
2654 C2	3319 B2	3720 C1	7303 B2
2655 D2	3320 B2	3721 C1	7306 B3
2656 C2	3321 B2	3722 C1	7308 B2
2657 C2	3322 B2	3725 C1	7309 B2
2658 C2	3323 B2	3730 C1	7310 B2
2659 C2	3324 A2	3731 C1	7311 A2
2660 C2	3325 B2	3732 C1	7312 B2
2661 C2	3326 B2	3740 C1	7320 B3
2662 C2	3327 A2	3741 C1	7322 A2
2663 C2	3328 B2	3744 C1	7324 B2
2664 C2	3330 B2	3745 C1	7330 A2
2667 D2	3331 B2	3746 D1	7407 A3
2668 D2	3332 B2	3747 C2	7411 A3
2670 D3	3333 B2	3748 C2	7651 D2
2673 D2	3334 B2	3749 C2	7652 D3
2674 D2	3336 B2	3754 C1	7656 D3
2679 D2	3337 B3	3793 D1	7661 D3
2681 D2	3340 B2	3794 D1	7701 C1
2685 D2	3341 B2	3795 D1	7702 C1
2686 D2	3342 B2	3796 C1	7708 D1
2707 C1	3343 B2	3798 C1	7713 C1
2710 C1	3344 B2	4002 A1	7716 C1
2712 C1	3345 B2	4003 B1	
2717 C1	3346 B3	4004 B1	

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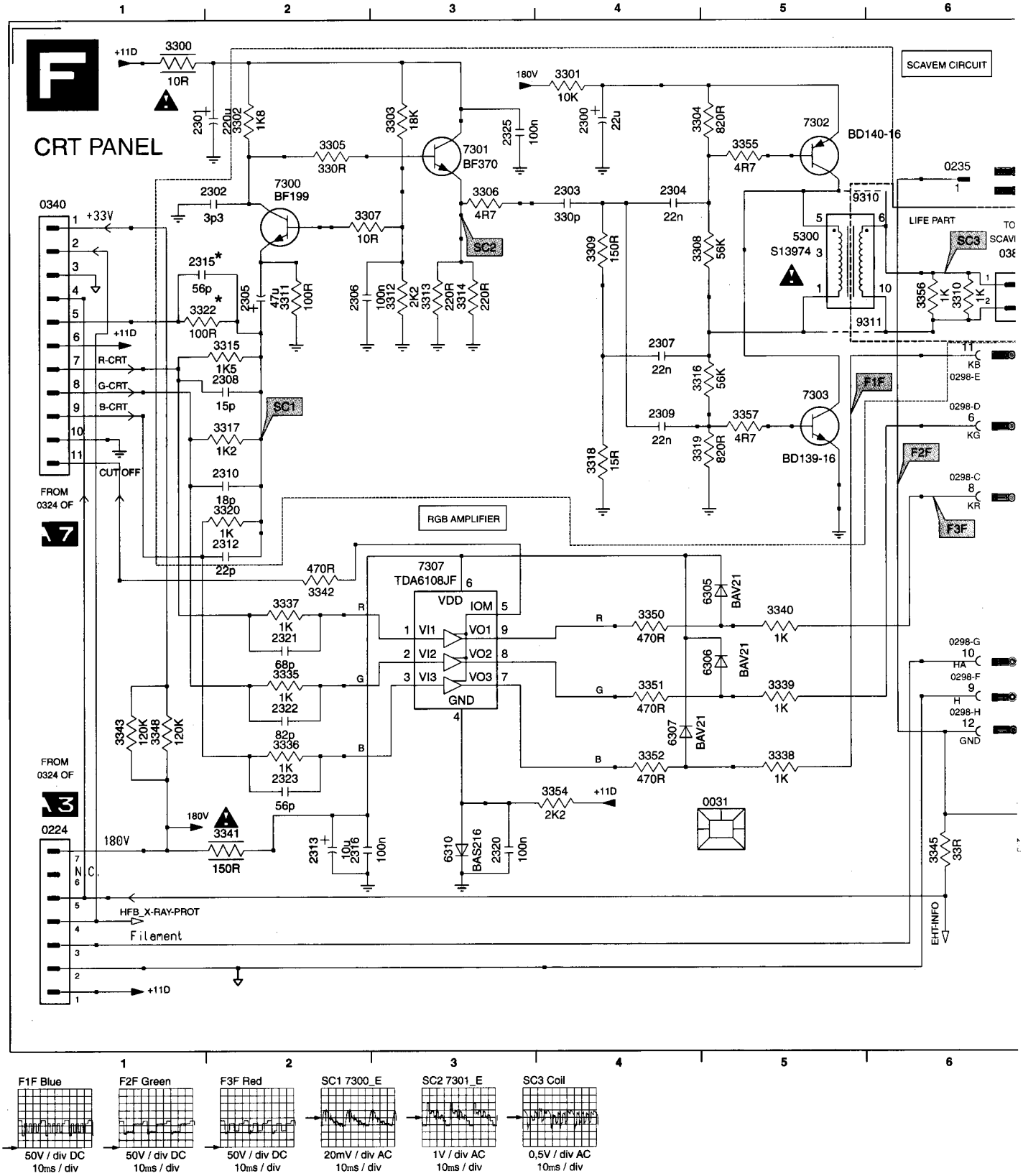
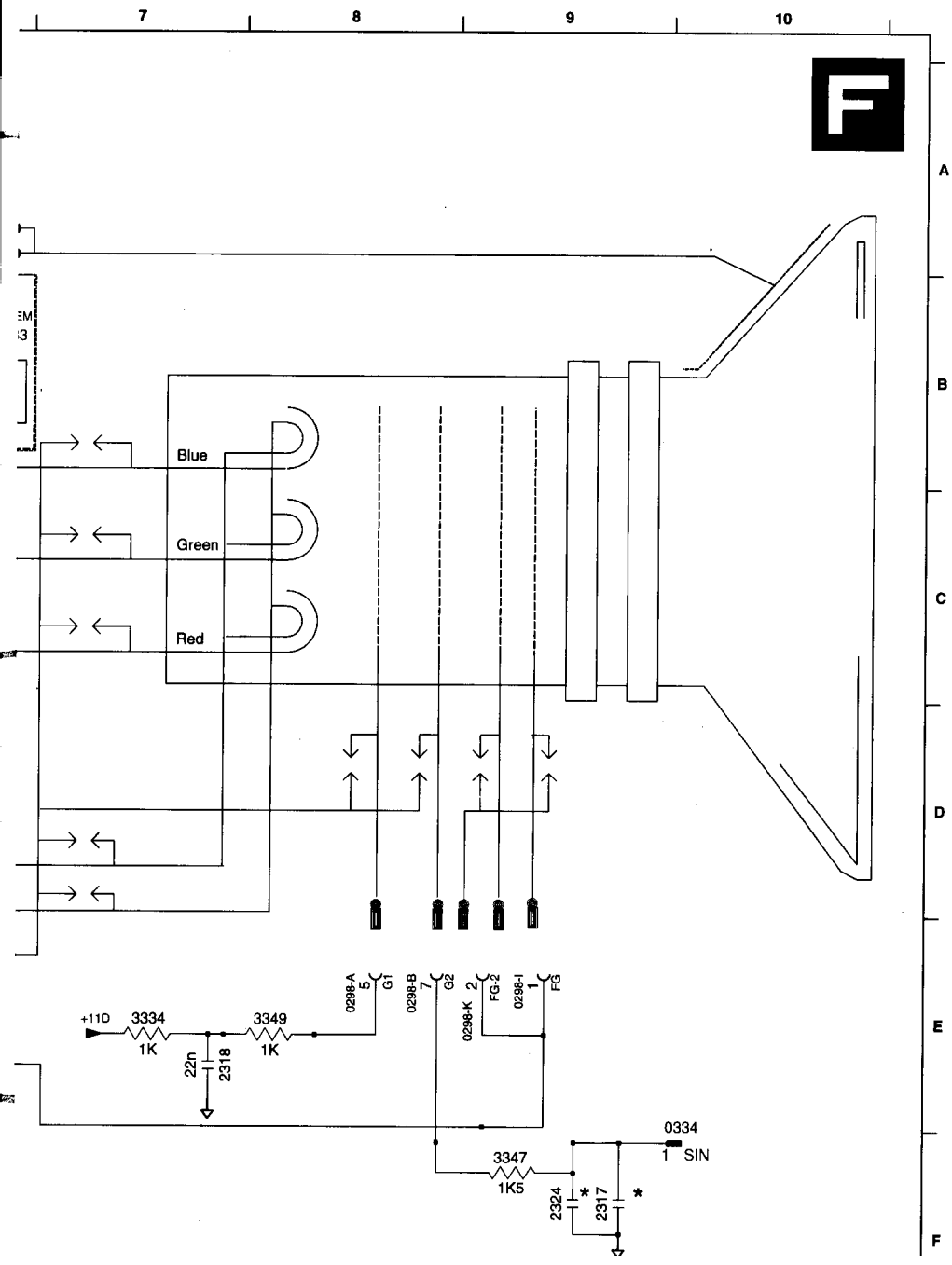
CRT panel

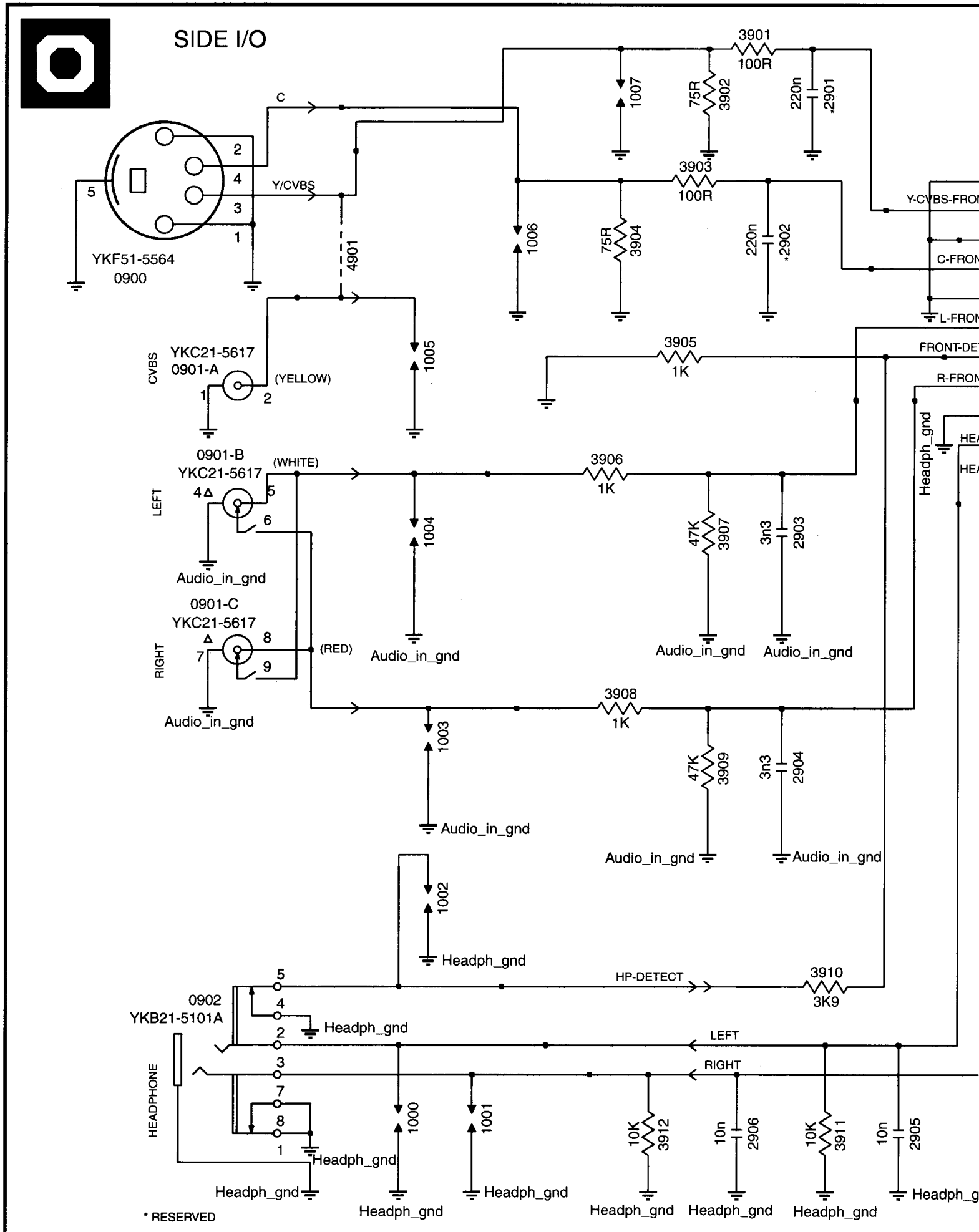
0031 E5	0298-G D6	2302 A2	2312 D2	2323 E2	3306 A3	3315 B2	3336 E2	3347 F9	3357 C5	7303 C5
0224 E1	0298-H E6	2303 A4	2313 E2	2324 F9	3307 B2	3316 C5	3337 D2	3348 E1	5300 B5	7307 D3
0235 A6	0298-I E9	2304 A4	2315 B1	2325 A3	3308 B5	3317 C2	3338 E5	3349 E8	6305 D5	9310 A5
0298-A E8	0298-K E9	2305 B2	2316 E2	3300 A1	3309 B4	3318 C4	3339 D5	3350 D4	6306 D5	9311 B6
0298-B E8	0334 F10	2306 B2	2317 F9	3301 A4	3310 B6	3319 C5	3340 D5	3351 D4	6307 E4	
0298-C C6	0340 B1	2307 B4	2318 E7	3302 A2	3311 B2	3320 C2	3341 E2	3352 E4	6310 E3	
0298-D C6	0383 B6	2308 C2	2320 E3	3303 A3	3312 B3	3322 B1	3342 D2	3354 E4	7300 A2	
0298-E C6	2300 A4	2309 C4	2321 D2	3304 A5	3313 B3	3334 E7	3343 E1	3355 A5	7301 A3	
0298-F D6	2301 A1	2310 C2	2322 E2	3305 A2	3314 B3	3335 D2	3345 E6	3356 B6	7302 A5	

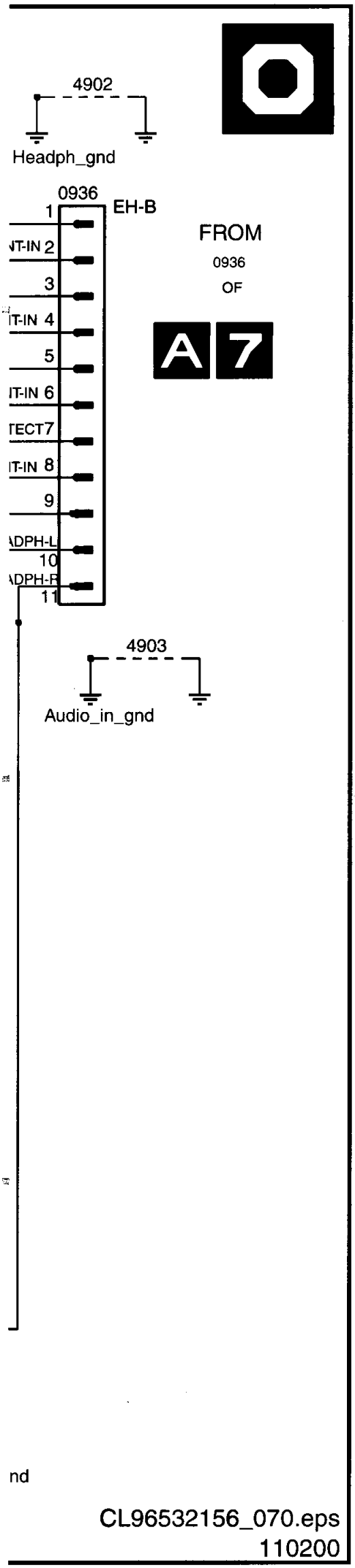




Diversity CRT-Panel					
PosNr	29"	25"	28"	28" WS	32" WS
0298	-	-	-	-	SOC 9P
0298	CON 8P	CON 8P	CON 8P	CON 8P	-
0383	CON 02P	-	-	CON 02P	CON 02P
2300	22U	-	-	22U	22U
2301	220U	-	-	220U	220U
2302	3P3	-	-	3P3	3P3
2303	470P	-	-	470P	470P
2304	22N	-	-	22N	22N
2305	47U	-	-	47U	47U
2306	100N	-	-	100N	100N
2307	22N	-	-	22N	22N
2308	15P	-	-	15P	15P
2309	22N	-	-	22N	22N
2310	18P	-	-	18P	18P
2312	22P	-	-	22P	22P
2317	4N7	4N7	4N7	4N7	-
2317	4N7	4N7	4N7	4N7	-
2321	-	68P	68P	-	-
2322	-	82P	82P	-	-
2323	-	56P	56P	-	-
2324	-	-	-	-	820P
2325	100N	-	-	100N	100N
3300	FUSE 10R	-	-	FUSE 10R	FUSE 10R
3301	3W 10K	-	-	3W 10K	3W 10K
3302	1K8	-	-	1K8	1K8
3303	18K	-	-	18K	18K
3304	820R	-	-	820R	820R
3305	330R	-	-	330R	330R
3306	4R7	-	-	4R7	4R7
3307	10R	-	-	10R	10R
3308	56K	-	-	56K	56K
3309	150R	-	-	150R	150R
3310	1K	-	-	1K	1K
3311	100R	-	-	100R	100R
3312	2K2	-	-	2K2	2K2
3313	220R	-	-	220R	220R
3314	220R	-	-	220R	220R
3315	1K5	-	-	1K5	1K5
3316	56K	-	-	56K	56K
3317	1K2	-	-	1K2	1K2
3318	15R	-	-	15R	15R
3319	820R	-	-	820R	820R
3320	1K	-	-	1K	1K
3335	100R	-	-	100R	100R
3335	-	1K	1K	-	-
3336	100R	-	-	100R	100R
3336	-	1K	1K	-	-
3337	100R	-	-	100R	100R
3337	-	1K	1K	-	-
3355	4R7	-	-	4R7	4R7
3356	1K	-	-	1K	1K
3357	4R7	-	-	4R7	4R7
5300	TFM	-	-	TFM	TFM
7300	SIGF199	-	-	SIGF199	SIGF199
7301	SIGF370	-	-	SIGF370	SIGF370
7302	TRA POW	-	-	TRA POW	TRA POW
7303	TRA POW	-	-	TRA POW	TRA POW
9305	WR	-	-	WR	WR
9308	WR	-	-	WR	WR
9309	WR	-	-	WR	WR
9312	WR	-	-	WR	WR
9313	WR	-	-	WR	WR
9424	-	-	-	-	WR

Side I/O


SIDE I/O
YKF51-5564
0900
C
Y/CVBS
4901
1007
1006
1005
1004
1003
1002
1000
1001
3901
100R
75R
3902
220n
*2901
3903
100R
75R
3904
220n
*2902
3905
1K
3906
1K
47K
3907
3n3
2903
3908
1K
47K
3909
3n3
2904
3910
3K9
10K
3912
10n
2906
10K
3911
10n
2905
CVBS
YKC21-5617
0901-A
(YELLOW)
0901-B
YKC21-5617
(WHITE)
LEFT
0901-C
YKC21-5617
(RED)
RIGHT
Audio_in_gnd
0902
YKB21-5101A
HEADPHONE
Headph_gnd
HP-DETECT
LEFT
RIGHT
Y-CVBS-FRON
C-FRON
L-FRON
FRONT-DE
R-FRON
HEA
* RESERVED



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110200

8. Electrical alignments

8.1 General alignment conditions

All electrical alignments should be made under the following conditions:

- Power supply voltage: 230 V ± 10 %; 50 - 60 Hz ± 5 %. Should be applied via an isolating transformer with low internal resistance.
- Warm-up time ≈ 20 minutes.
- Voltages and oscillograms are measured in relation to Tuner earth (with exception to the voltages on the primary side of the power supply). Never use the cooling fins/plates as ground: they are 'hot' ! ! !
- Test probe: Ri > 10 MΩ, Ci < 20 pF.
- Use an isolated trimmer/screwdriver for the alignments

8.2 Alignments on the large signal panel (LSP)

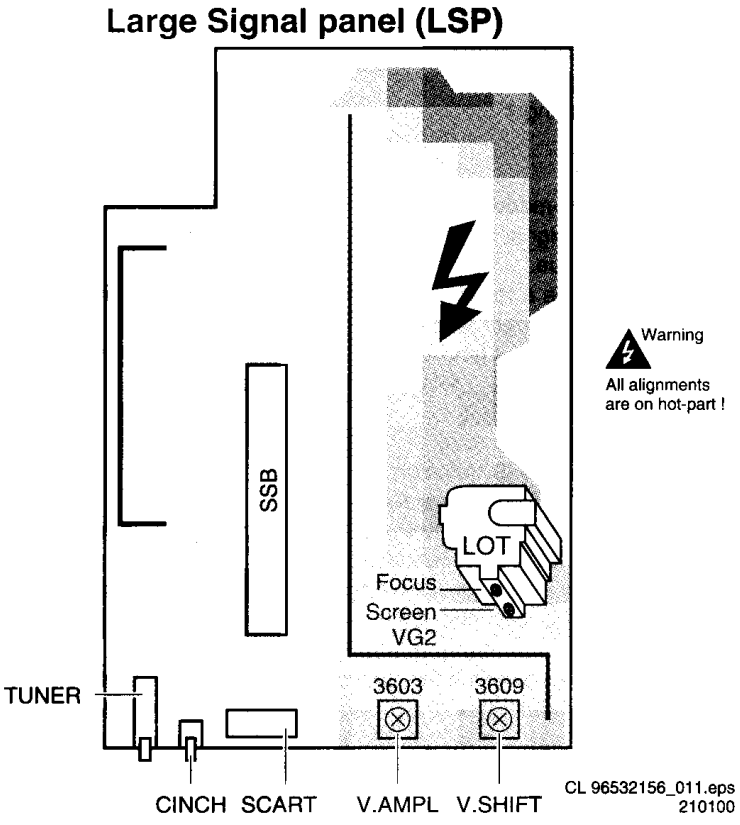

Figure 8-1

8.2.1 Focusing

1. Tune the set to a crosshatch test pattern (use an external video pattern generator).
2. Adjust the Focus potentiometer (upper potmeter, see figure 8-1) for an overall optimum focusing of the picture.

8.2.2 Vg2 adjustment

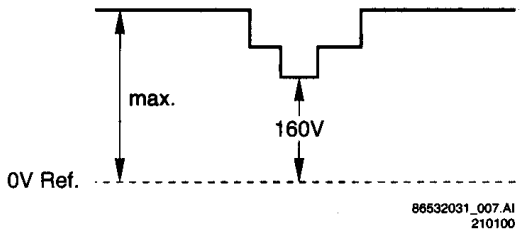

Figure 8-2

Elucidation: In the frame blanking period of the R, G and B signals applied to the CRT, a measuring pulse with different DC levels is inserted by the 'HOP' video processor. Measure the black level pulse during the vertical flyback at the RGB cathodes of the CRT.

1. Put the set in the SDM mode (see chapter 5.2.1).
2. Insert a black test-pattern signal (carrier 475.25 MHz) to the Tuner input.
3. Connect an oscilloscope (position 50 V/Div DC and 2 ms/Div) alternately to the CRT cathodes (Red pin 8, Green pin 6, Blue pin 11) and measure for each cathode the DC level of the measuring pulse (see elucidation above and figure 8-2) and write down each value. Remark: Trigger the scope external via a CVBS signal (for instance via pin 19 of the SCART1 connection).
4. Adjust the Vg2 potentiometer (lower potmeter, see figure 8-1) so that the measuring pulse with the highest noted level is on 160 ± 3 V_{DC} level.

8.3 Vertical amplitude alignment

1. Tune the set to a crosshatch test pattern (use an external video pattern generator).
2. Align the vertical amplitude with R3603 (see Fig. 8-1) so that the complete test pattern is visible.

8.4 Vertical shift alignment

1. Tune the set to a crosshatch test pattern (use an external video pattern generator).
2. Align the vertical centering with R3609 (see Fig. 8-1) so that the test pattern is located vertically in the middle.
3. Repeat the 'vertical amplitude' alignment if necessary.

8.5 Alignments and settings in the Service Alignment Menu

8.5.1 General

Put the set in the SAM mode (see chapter 5.2.2). The Service Alignment Mode menu will now appear on the screen. Via 'Alignments' the following submenu's can be selected:

- General:
  - Drive
  - Luminance Delays
  - EHT Compensation
  - Soft clipper
  - Luma gain
  - IF AFC
  - Tuner AGC
  - Blend intensity
  - Adjust Peak White Limiter
  - Vg2 Test Pattern
- Normal Geometry: General geometry alignments.
- Super Wide Geometry: Geometry alignments for the 'Panorama' position in 16:9 sets (only valid for wide screen sets; alignments can be performed, however, it is better to set values as mentioned below).
- Options: Setting the initialisation codes in the set via text.
- Option Numbers: All options together, expressed in two long numbers. The original factory setting for these numbers can be found on the picture tube sticker on the inside of the set.
- Store: Store all alignments.

The alignments are explained now in the sequence of the sub-menu:

8.5.2 'General' alignments in Service Alignment Menu:

- Once all alignments/settings have been completed the item 'Store' must be selected to record all the values in the permanent memory of the set.
- If the Option codes have been changed and stored, the set has to be switched 'OFF' and 'ON' using the mains switch to activate the new settings (when switching via Standby, the option code settings are NOT read by the microprocessor).
- If an empty EAROM (permanent memory) is detected, all settings are set to pre-programmed default values.
- A built-in test pattern can be called up in various sub-menus. The test pattern generator can be switched on using the item 'Test pattern on/off'. The test pattern only appears AFTER the specific alignment has been selected. The test patterns are generated by the Teletext-IC (OTC).

'Drive'

- Method 1 (with colour analyser):
  1. If you want to align tint-settings with a colour-analyser, the Test pattern must be switched on. You get a white block in middle of the image now.
  2. Before doing the Tint-settings the 'Cathode'-parameter must be aligned. This is dependent of the picture tube size and brand. See table "Cathode parameter" for the colour-analyser readings.
  3. Tint-settings: Set the white levels for the 3 Tint-settings 'Normal', 'Warm' and 'Cool'. The next values must be aligned (see table "White levels").

Cathode parameter	
CRT	Light output (cd/m^2)
25" FS	50,0
28" FS	35,0
29" SF	40,0
28" WS	45,0
32" WS	40,0

White levels			
	Cool	Normal	Warm
X	280	289	303
Y	287	299	314
Temp. (K)	10200	8700	7200

- Method 2 (without colour analyser):
  1. Without having a colour-analyser one can set some parameters. This is the next best solution. The setting-parameters are average values coming from production (statistics).
  2. Before doing the Tint-settings the 'Cathode'-parameter must be set. For all picture tubes the value '5' must be entered.
  3. The 'Tint' setting must be on 'normal'.
  4. Tint-settings: Set the Red, Green and Blue parameters for the 3 Tint-settings 'Normal', 'Warm' and 'Cool'. See table 8.4 for the values.
  5. Red BL offset: herewith the Black Level can be aligned very precise. Pre-set value is 7.
  6. Green BL offset: herewith the Black Level can be aligned very precise. Pre-set value is 7.

Tint settings			
	Cool	Normal	Warm
R	24	25	27
G	20	20	20
B	18	14	10

'Luminance delays'

With the 'Luminance delays' alignment the luminance information is placed on the chrominance information (brightness is pushed onto the colour). Use a colour bar/grey scale pattern as test signal.

- Lum. Delay Pal: Apply a PAL colour bar/grey scale pattern as a test signal. Adjust 'Lum. Delay Pal' until the transients of the colour part and black and white part of the test pattern are at the same position.
- Lum. Delay Secam: Apply a SECAM colour bar/grey scale pattern as a test signal. Adjust 'Lum. Delay Pal' until the transients of the colour part and black and white part of the test pattern are at the same position.
- Lum. Delay Bypass: apply a NTSC colour bar/greyscale pattern as a test signal. Adjust value until the transients of the colour and black & white part of the test area are at the same position.

'EHT compensation'

Fixed setting: 0

'Soft clipper"

Fixed setting:Pwl + 0%

'Luma gain'

Fixed setting:1

'IF AFC'

The SAM-mode is needed to make alignment, a test generator to make signal and the Installation-menu to check the 'Fine Tune' value.
Supply, via a video generator (e.g. PM5518), a TV-signal with a signal-strength of at least 1 mV and a frequency of 475.25 MHz. Use BG if possible, otherwise match the system of your generator with the received signal in the set.

Alignment procedure:

1. Go to the 'Installation' menu.
2. Select 'Manual installation'.
3. Tune the TV-set to the system and frequency described above via 'Search' - '475' - 'OK'.
4. If the frequency showed in the line 'Fine tune' is between 475.18 MHz and 475.31 MHz, you don't need to re-adjust the IF-AFC.
5. If not, adjust the frequency in the 'Fine tune' line to 475.25 MHz and 'Store' the program (this is very important because this will disable the AFC algorythm).
6. Now go to the SAM and select 'Alignments' - 'General' - 'IF AFC'.
7. During the 'IF AFC'-parameter adjustment, one can see OSD feedback in the top of the screen. The OSD feedback can give 4 kind of messages:

AFC-window	AFC-frequency versus reference
Out	High
In	High
In	Low
Out	Low

The first item (In or Out) informs you whether you are in or out the AFC-window.
The second item (High or Low) informs you about whether the AFC-frequency is too high or too low.

1. First you must align the 'IF AFC'-parameter such that you come into the AFC-window (= 'In')
2. Then you must look for the point where the 'IF AFC'-parameter changes from High to Low. This level is the value you are looking for.
3. After adjustment 'Store' the value.
4. Now return to the 'Installation' menu.
5. Select 'Manual Installation' - 'Search' - '475' - 'OK' and 'Store'. This will set the AFC 'on' again.

Service-tip: If you do not trust the accuracy of the frequency of your Service-generator, first 'measure' with 'Fine tune'-line (manual install-menu) of a good set your video generator.

'Tuner AGC'
The SAM-mode is needed to make alignment, a test generator to make signal, a DC-Voltmeter to measure at pin 1 of Tuner.

Supply a TV-signal, with a frequency of 475.25 MHz and a signal-strength of about 2 mV. Measure the DC-voltage on pin 1 of the Tuner (position 1200). With the 'Tuner AGC'-alignment in the SAM-menu, this voltage can be aligned. Alignment is correct when DC-voltage is just below 3.5 V.

'Blend intensity'
(This alignment could be used when micro controller or HOP-IC has been replaced).
It aligns the level of transparency of the menu-picture blended into the main-picture.
1. Position the brightness-, contrast- and colour setting in the middle position (picture-menu).
2. Apply a signal with a 100 % white video-pattern.
3. Connect an oscilloscope to pin 7 of connector 0340 of the CRT panel and measure the Red output level.
4. Align 'blending intensity'-parameter such that the blended signal is 65 % of the black-white amplitude. Practically this will be about 1.3 V (blended signal) versus 2 V (full white signal).
5. The parameter can be adjusted in between 0 and 31.

'Adjust Peak White Limiter'
Depending on the picture-tube size, the next value of the table must be entered:

Peak White Limiter	
25" FS	4
28" FS	4
29" SF	4
24" WS	4
28" WS	4
32" WS	4

'Vg2 Test Pattern'
Here the Vg2 Test pattern can be switched on.

8.5.3 'Normal Geometry' alignments in the Service Alignment Menu

Warning: At this moment, the 'INTERNAL TEST PATTERN' of the set software will lead to a mis-alignment of the picture geometry. Therefor use an external generator with a geometry pattern (e.g. crosshatch) to align the set (only for the 'Vertical slope' adjustment the internal test pattern can be used).

'Vertical slope'
Select 'Test Pattern on' (read warning above).
1. Set the start conditions for 16:9 sets: ~~'V. S-correction' value on 8 for the 28" and on 7 for the 32" set.~~ The boundary-stripes of the test pattern should be positioned on the edge of the picture tube.
2. Align 'V. slope' (when aligning the below half of the picture is blanked). The middle line of the test pattern must be matched with the edge of this blanking/picture transient in the middle of the picture. Pushing 'MENU' button again, gives you previous menu again. (This alignment is meant to align the zero crossing of the frame-deflection to the mechanical middle of the picture tube.)

'Horizontal amplitude and centring'
Use an external pattern generator with a geometry pattern (e.g. crosshatch).
1. Using 'H. amplitude' align the horizontal amplitude so that the entire test pattern is visible.
2. Use an external test signal, with a centre-reference from a service-generator. Use 'H shift' to align the picture horizontally in the middle.
3. Repeat the 'H amplitude' alignment if necessary.

'East/west alignment'
Use an external pattern generator with a geometry pattern (e.g. crosshatch).

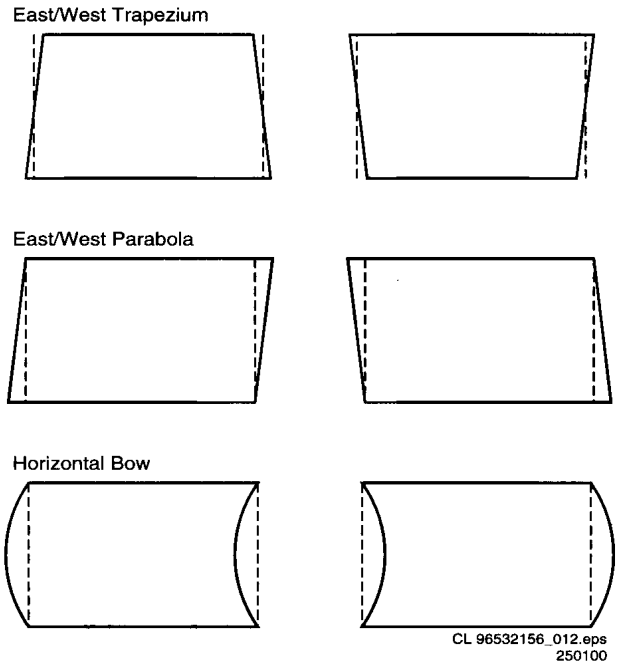

Figure 8-3

1. Use 'East/West Parabola' to align the vertical lines until straight.
2. 'Upper East/West corner' to align the vertical lines in the upper corners until straight.
3. 'Lower East/West corner' to align the vertical lines in the lower corners until straight.
4. Use 'East/West Trapezium' to align for a rectangular.
5. Use 'Horizontal Parallelogram' to align for straight vertical lines if necessary.
6. Horizontal Bow' (neutral value 31. With this alignment the E/W parabola can be corrected such that it becomes symmetrical).

Repeat steps 1 to 6 if necessary.

8.5.4 'Super wide geometry' alignments (for widescreen sets) in the Service Alignment Menu

The header of this paragraph and also the menu's are somewhat misleading. We only need to set the following values (if the normal geometry alignment has been performed correctly):
1. ~~V. S-Correction: enter value of 'normal geometry' alignment.~~
2. H. amplitude: enter value of 'normal geometry' alignment subtracted by 4.
3. East/west Parabola: enter value of 'normal geometry' alignment.

8.6 Option menu

8.6.1 Introduction:

The microprocessor communicates with a large number of I^2C-IC's in the set. To ensure good communication and make digital diagnosis possible, the microprocessor has to know which IC's have to be addressed. The presence of specific IC's or functions is made known by means of the option codes.

All options codes can be manipulated using both the option numbers and/or the Option menu.
All hardware related options are incorporated under the heading 'Options' of the 'Alignments' sub-menu of the 'Service Alignment Mode'. All software related options that are incorporated under the heading 'Dealer Options' of the 'Service Alignment Mode", can also be reached directly via the 'DEALER' button of the DST.

8.6.2 Options in the Service Alignment Mode

Menu-item	Subjects	Options	Physically in the set
Dual screen/PIP	Aux type	Yes	Dual Screen / PIP module present
		No	Dual Screen / PIP module not present
Teletext/EPG	TXT	Yes	Teletext present
		No	Teletext not present
	NextView present	Yes	NextView set
		No	NextView not set
	NextView type	Flashram	Flash-RAM present
		No Flashram	Flash-RAM present
Communication	Easylink Plus	Yes	Easylink Plus set
		No	Easylink Plus not set
Picture Tube	CRT Type	4:3	4:3 picture tube
		16:9	16:9 picture tube
	Picture Rotation	Yes	Frame rotation circuitry present (diagram A4)
		No	Frame rotation circuitry not present
	Dynamic focus	Yes	Dynamic focus picture tube present
		No	Dynamic focus picture tube not present
	Dooming prevent	Off	
		4:3	
		SF 16:9	
		RF 16:9	
Video repro	Featurebox type	Eco	PROZONIC not present
		Prozonic	PROZONIC present
	Field memories	2	
		3	
	Lightsensor	Yes	Lightsensor present
		No	Lightsensor not present
	PALplus	Yes	PALplus module present
		No	PALplus module not present
	Combfilter	Yes	Not valid for Europe
		No	
	Picture improvement	Yes	
		No	
	Picnic	Yes	PICNIC present
		No	PICNIC not present
	Picnic AGC	Yes	In normal operation: Yes
		No	During 'Drive' alignments: No
	Signalling bits	Yes	
		No	
Source Selection	External 3	Yes	3rd EURO connector present
		No	No 3rd EURO connector present
	External 4	Yes	4th EURO connector present
		No	No 4th EURO connector present
Audio Repro	Dolby	None	
		Pro Logic	
	Rear speakers	Corded	Passive surroundbox present
		Virtual	
		Cordless	Active surroundbox present
	Acoustic system	FL7	Applicable for sets with subwoofer
		FL8	Applicable for sets without subwoofer
		FL9 Monitor	Monitor look (only tweeters at both sides)
		FL9 DAS	FL9 with full range speakers at both sides
	MSP type	MSP3411	
		MSP3415	
		MSP3451	
	AVL enable	On	
		Off	
Miscellaneous	Heatsink Present	Yes	Heatsink present on CRT/SCAVEM panel (diagram F)
		No	Heatsink not present on CRT/SCAVEM panel (diagram F)
	Tuner type	UV1316	
		TEDE9	

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8.6.3 Dealer Options in the Service Alignment Mode

- After the option(s) have been changed, they must be stored via the 'STORE' command.
- The new option is only active after the TV is switched off and then back on again using the mains switch (the EAROM is then read out again).

8.6.4 Option number

In case the EAROM has to be replaced, all the options will also require resetting. To be certain that the factory settings are reproduced exactly, both option numbers have to be set. These numbers can be found on a sticker on the picture tube.

Example: Option number 28PT7306/12 could be:
04929 04418 04417 00016
08199 00001 00000 00000

The first line indicates the hardware options 1 to 4, second line is reserved for the software options.
Every 5-digit number represents 16 bits (so maximum number can be 65536 if all options are set).

Bit	HW1	HW2	HW3	HW4	SW1	SW2	SW3	SW4
0 (1)	FBX (1)		EXT3	MSP (8)	Auto TV	CTI		
1 (2)	FBX (1)	Dolby PL	EXT4	MSP (8)	Auto Store mode (10)			
2 (4)	FBX (1)	Virtual rear spkrs		China IF	Auto Store mode (10)			
3 (8)	Combfilter	Cordless rear spkrs		Tuner (9)				
4 (16)	PAL-Plus	Dolby Digital	Dual Screen (6)	TXT	Picture mute			SLDP (13)
5 (32)	Field mem. (2)		Dual Screen (6)	China TXT	Demo			SLDP (13)
6 (64)	Light sensor	Cabinet (4)	TXT-EPG-DS		Virgin			AVL
7 (128)	LTP	Cabinet (4)	Aux-headphone					
8 (256)	PICNiC	P50	Aspect Ratio (7)					
9 (512)	PICNIC-AGC		Tilt					
10 (1024)			DAF					
11 (2048)	LNA (3)							
12 (4096)	WSS	EPG	Heatsink		TXT pref. (11)			
13 (8192)	Time constant	EPG type (5)	Home Cinema		TXT region (12)			
14 (16384)								
15 (32768)								

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All bits can be set 'On' (= 1) when the option is available or 'Off' (= 0) when it is not, except for:
(1) 0 = Eco, 1 = PROZONIC, 4 = Eco-DNR.
(2) 0 = 2 Field memories, 32 = 3 Field memories.
(3) 0 = Normal, 8192 = Fast.
(4) 0 = FL7, 64 = FL8, 128 = FL9.
(5) 0 = Type 2, 8192 = Type 2C3.
(6) 0 = None, 16 = PIP, 32 = Dual Screen.
(7) 0 = 4:3, 256 = 16:9.
(8) 0 = MSP3415, 1 = MSP3451, 2 = MSP3411.
(9) 0 = Philips, 8 = Alps.
(10) 0 = None, 2 = PDC/VPS, 4 = TXT-Page, 6 = PDC/VPS/TXT-Page.
(11) 0 = TOP, 4096 = FLOF.
(12) 0 = East, 8192 = West.
(13) 0 = Off, 16 = 4:3, 32 = SF16:9, 48 = RF16:9.
When all the correct options are set, the sum of the decimal value (between brackets in 1st column) of each column will give the option number.

9. Circuit descriptions and abbreviation list

9.1 Circuit descriptions

The following circuits are described:
1. Introduction
2. Block diagrams
3. Power supply
4. Control
5. Tuner & IF
6. Video: High-end Input Processor
7. Video: Feature box
8. Video: High-end Output Processor
9. Synchronisation
10. Horizontal deflection
11. Vertical deflection
12. Audio
13. Teletext / NexTView
14. CRT / SCAVEM / Rotation
15. Software related features

9.1.1 Introduction

The EM2E Europe is a lower specified MG-chassis. EM stands for Eco-MG, 2 for the used processor (1 = Painter, 2 = OTC) and E stands for Europe. This will be, at the moment of launch, the cheapest realised 100 Hz set.

The architecture consist of a conventional large signal panel (LSP) and a small signal board (SSB) module, placed into a so called SIMM-connector (Standard Interface, 80 pins).

The LSP is built up very conventional, with hardly any surface mounted components on the copper side. Difference with the MG-chassis is that the EM2E LSP has a very large 'hot' part, including the deflection coil.

The SSB is a high tech module (2 sides reflow technology, full SMC) with very high component density and complete shielding for EMC-reasons. Despite this, it is designed in such a way, that repair on component level will be possible. To achieve this, attention has been paid to:
- The position of service test lands (Tuner side).
- Accessibility (Tuner side).
- Clearance around surface mounted IC's (for replacing).
- Diagnostics & Fault Finding via ComPair.

Due to the low amount of cabling etc., expectation is that the FCR will be low.

Attention: During the first 4 to 6 months of production, the EM2E set-software will be integrated into a flash-RAM on the SSB. After that period, a mask-ROM will be used. Which IC is used is not of interest for service, but for both solutions it means that Service Workshops must be equipped with dedicated (de)solder equipment for exchanging these IC's.
In case flash-RAM or mask-ROM has to be replaced in the field, dealer will receive always an up-to-date flash-RAM.

Warning: Be aware that half of the LSP-circuitry is 'hot', including the deflection coil.

Protection: The start-up behaviour of the EM2E is different then that of the MG-chassis, meaning that there does not exist a situation as in the MG where we have 'supply ON / deflection circuit OFF'.
This means that isolating failures in the EM2E must be done in a different way. See Chapter 5 of this manual.

9.1.2 Block diagrams

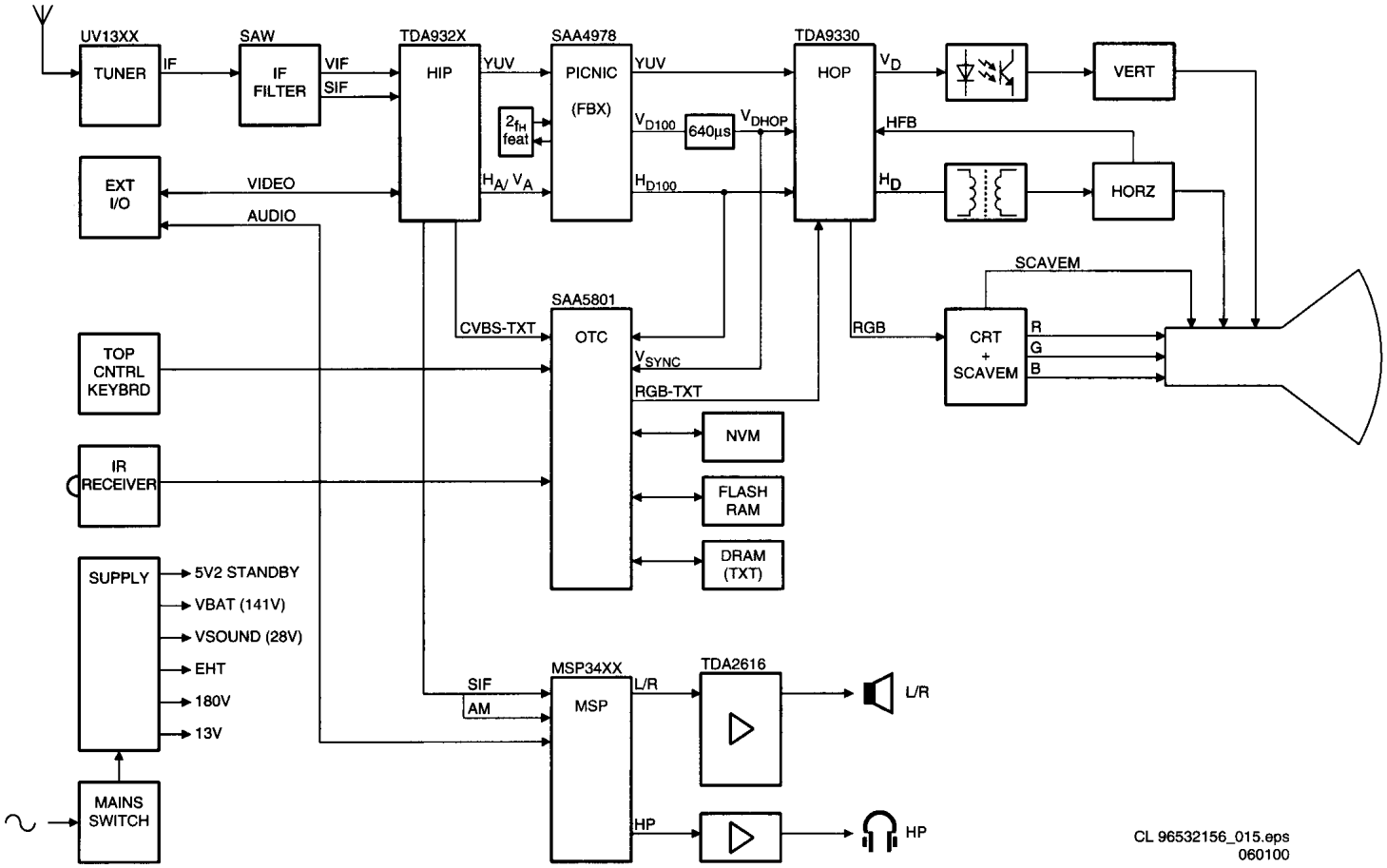

Figure 9-1

The tuner type UV1316 is a PLL tuner and delivers the IF-signal, via audio & video SAW-filters, to the HIP (High-end Input Processor). The HIP has the following functions:

- IF modulation.
- Video source- and record select.
- Colour decoder.
- Synchronisation.

Two SCART-connectors can be used: SCART1 is fully equipped and SCART2 is meant for VCR. Pin 10 of SCART2 is used for Easylink and there is a possibility for Y/C in. The CVBS-out on pin 19 can be used for WYSIWYR (What You See Is What You Record).

The HIP delivers the signal to the PICNIC. This IC takes care of:

- Analogue to Digital conversion and vice versa.
- 50 to 100 Hz conversion.
- Panorama mode.
- Noise reduction.
- Dynamic contrast.

For Digital Scan the PROZONIC is required, which can be connected to the PICNIC. This IC is mentioned as 2fH features in the blockdiagram.

After the PICNIC the, now 100 Hz, YUV- and H/V-signals are fed to the HOP (High-end Output Processor). This IC handles the video control and geometry part. The RGB-signals from TXT/OSD are also inserted via the HOP. The video part delivers the RGB signals to the CRT-panel and the geometry part delivers the H-drive, V-drive and also a drive-signal for rotation (as a variable DC-level on the V-drive signal).

Both deflection circuits are 'hot' and located on the LSP and are driven by the HOP. To make the galvanic separation, the line drive is driven via transformer 5410 and the framedrive via optocoupler 7610.The horizontal output stage generates some supply voltages, the EHT-, focus- and Vg2-voltages.

The RGB amplifiers on the CRT-panel are integrated in one IC and are supplied with 180 V from the LOT.
The SCAVEM circuit modulates transitions of the Luminance (Y) signal on the horizontal deflection current, giving a sharper picture.

The sound part is built around the MSP34xx (Multichannel Sound Processor) for IF sound detection, sound control and source selection. Dolby decoding is also done by the MSP. Amplification is done via an integrated power amplifier IC, the TDA2616.

The microprocessor, called OTC (OSD, Teletext and Control), takes care of the analogue TXT input- and output processing. The OTC, ROM and RAM are supplied with 3.3 V, which is derived from the +5VSTANDBY.
The NVM (Non Volatile Memory) is used to store the settings, the FLASH RAM contains the set software and the DRAM is used for storing the Teletext pages.

In EM2E there is a separate Standby Supply in order to reduce the Standby power consumption. During Standby, the Main Supply is switched off (via TS7529). A relay is used to switch the Degaussing circuit.

The Main Supply, a SMPS based on the 'down-converter' principle, generates the 141 V (V_{BAT}) and the 28 V for the audio part.
Difference with former MG-sets is that V_{BAT} is not mains isolated (is 'hot') and is alignment free.

9.1.3 Power supply (diagram A1 & A2)

General
The power supply has a number of main functions. These functions are dealt with in succession:

- Mains filter
- Degaussing picture tube
- Standby power supply
- Main supply

Mains filter (diagram A1)

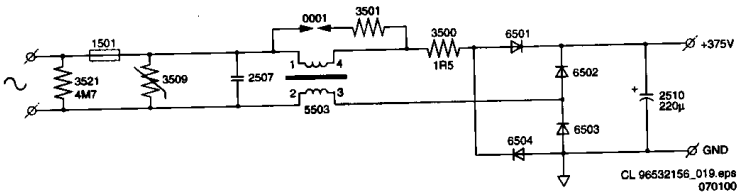

Figure 9-2

The mains filter has 2 functions: it prevents high-frequency signals to be transferred into the mains and it protects the set from lightning damage.

C2507 prevents the high-frequency signals, generated by the set, to be conveyed into the mains by short-circuiting them.

In case of a lightning surge between the 2 phases (differential mode) the energy is immediately bled away through the VDR (R3509) to the other phase.
In case of a lightning surge on both phases of the mains in relation to the aerial earth, the mains filter acts as a high resistance (U_{EMK}=L * dI/dt) as a result of which the voltage across coil L5503/04 increases. A spark gap (0001) prevents that the voltage increases too much, which would lead to a damaged coil. When ignited, the current will be discharged via this spark gap.
The two networks using R3503//0002 and R3502//0003 are also used for lightning protection. They lead the energy of a common-mode lightning surge from the 'cold' to the 'hot' side in case of insertion on the aerial or from the 'hot' to the 'cold' side in case of insertion via the mains-input.
Resistor R3500 is used for limiting the inrush-current.

For 240 V_{AC} mains-voltage applications, jumper 9502 is used. Diodes 6501 to 6504 now work as bridge rectifier charging C2510. For 110 V_{AC} mains-voltage applications, i.s.o. jumper 9502, jumpers 9503 and 9504 are used. Now the diodes will work as a voltage doubler charging C2516 and C2517 (not implemented for Europe).

Degaussing picture tube (diagram A1)
After switching 'ON' the set via the mains-switch, the DEGAUSS_INPUT signal from the processor (OTC) will be made high, transistor 7528 will conduct and relay 1002 will be activated. Initially a considerable current will flow, via PTC 3516, through the degaussing coil. The PTC will heat up, resistance will rise and the current will decay rapidly. The OTC will switch off the relay after 12 seconds.

Standby power supply (diagram A2)
This power supply is of a SOPS type (Self-Oscillating Power Supply) and is regulated by the controlled switching of an oscillator. It uses the so-called 'Flyback' principle:

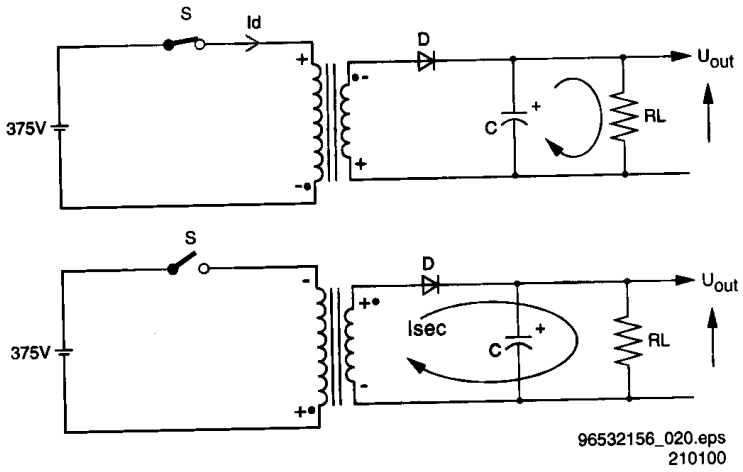

Figure 9-3

- After closing switch 'S', the current I_D will increase linear in time. The magnetic energy in the primary coil is directly proportional with the self-inductance of the coil and current I_D (thus with the time the switch is closed). The voltage polarity at the secondary winding is negative (due to different winding direction), meaning that diode D will block. Capacitor C will discharge via R_L, U_{OUT} will decrease.
- Opening switch 'S' will generate a counter-e.m.f. in the primary winding, trying to maintain current I_D. Through this the polarity of the secondary voltage will inverse. The magnetic energy, stored in the coil, will now be transformed to the secondary side. Diode D will now conduct, capacitor C will be charged and U_{OUT} will increase.

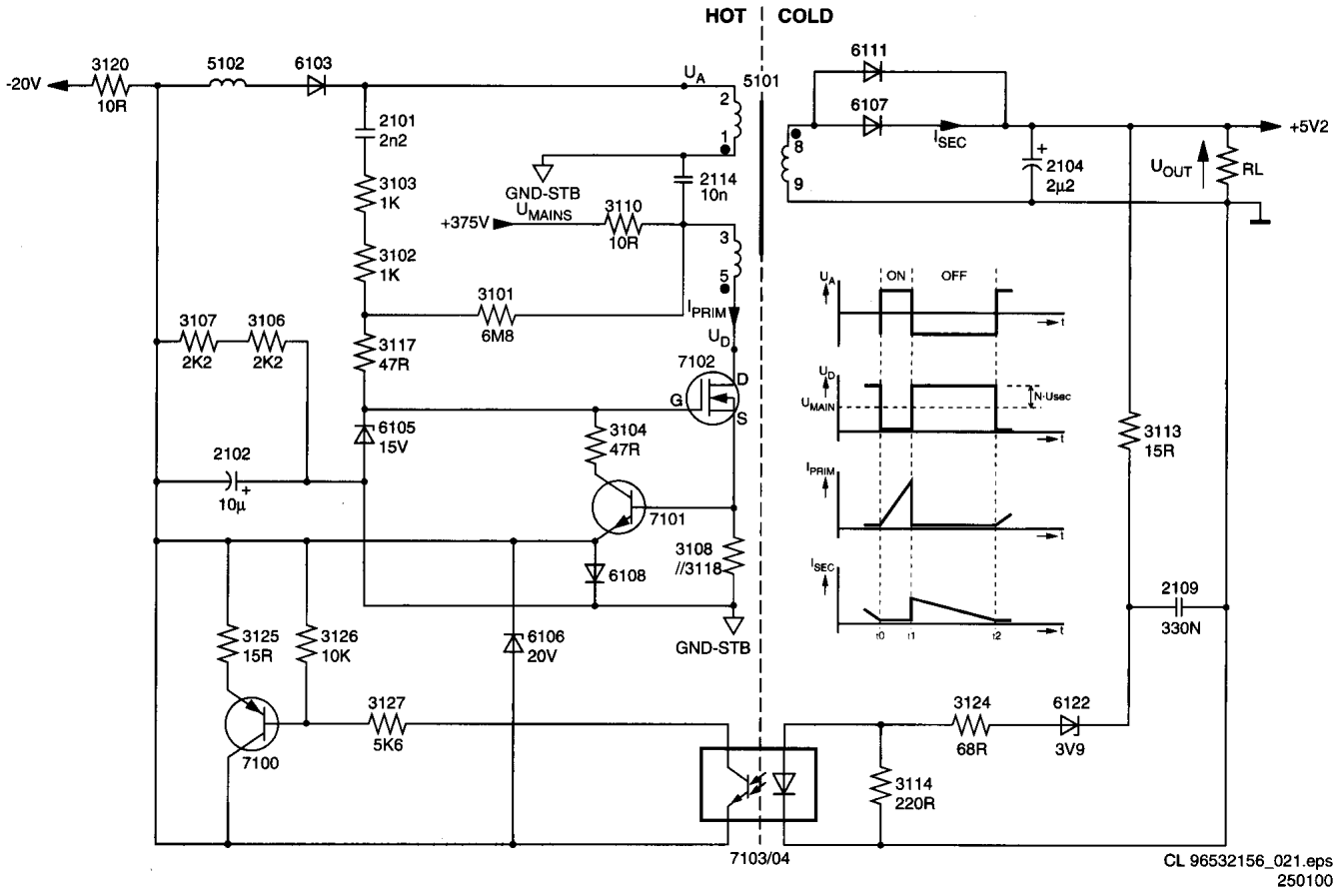

Figure 9-4

To apply this on the EM2E (diagram A2): replace Switch 'S' by FET TS7102, coil L by L5101, diode D by D6107//D6111 and C by C2104.

Time interval t0 - t1:
After switching on the set, the gate of MOSFET TS7102 will be high (max. 15 V due to zenerdiode D6105). This will drive the FET into saturation (U_{DS} = 0 V). The DC-voltage U_{MAINS} will be transposed across the primary winding of L5101 (3, 5) resulting in a linear increasing current through this coil.
The voltage across the co-coupled coil (1, 2) is also positive and will keep the FET into conductivity via C2101, R3103, R3102 and R3117 for some time. The slope of the primary current is determined by the self-induction of the coil and on the magnitude of the supply voltage (+375 V).
The maximum current is determined by the time the FET stays into conductance (t0 - t1). This time is directly determined by the voltage across R3108//R3118. This voltage is a measure of the current and if it exceeds 1.4 V, TS7101 will be driven into conductivity and consequently connect the gate of TS7102 to earth; the FET will block. The current will be: 1.4 V / (15//4.7 ohm) = 0.39 A.
The voltage across the secondary winding (8,9) will be negative, diodes D6111 and D6107 will block.

Time interval t1 - t2:
The sudden current interruption in the primary coil, will induce a counter-e.m.f. that wants to maintain the current. The voltage on the drain of the FET will increase. The secondary voltage (8, 9) will become positive and will charge C2104 via D6107 and D6111. All energy that was stored in L5101 during t0 - t1 will be transferred into the load. Due to the transformer principle, a voltage will now be induced in the primary winding (3, 5) and the co-coupled winding (1, 2). This voltage will be: N * U_{SEC} (N = winding ratio).

The voltage across the co-coupled coil will be negative, keeping the FET blocked.

Time t2:
At t2, the current through the secondary coil will be reduced to zero, as C2104 is no longer charged. As a consequence, the voltages will decay and will change polarity. The gate of the FET will be again made positive, is driven into conductivity and the cycle starts again.

Feedback, stabilisation:
The Standby Power Supply always oscillates at maximum power, the only limiting factor is the maximum primary current which has been pre-set with R3108//3118.
U_{OUT} is determined by R3114, R3124 and zenerdiode D6122. If the voltage across R3114 exceeds the threshold voltage of the diode of the optocoupler 7104 (±1 V) or, in other words, U_{OUT} exceeds 5.2 V, the transistor of the optocoupler will conduct.
Transistor TS7100 will be driven and a negative voltage will be transposed to the emitter of TS7101. When TS7101 conducts, the gate of the FET is at earth potential forcing the oscillator stop. Due to the load, the secondary voltage U_{OUT} will decrease. At a certain voltage, optocoupler TS7103/04 will block and the oscillator will start again.
Since there are no capacitors and there is a high amplification-factor in the feedback circuit, the feedback is ultra-fast. This is why the ripple on U_{OUT} is minimal. The negative supply voltage (-20 V) used in the feedback circuit originates from the co-coupling coil and is rectified through D6103.
Stabilisation is not effected through duty-cycle control but through burst-mode of TS7100.
Burst-mode is load dependent. If the power supply is less loaded, the secondary voltage will have the tendency to increase more rapidly. If the load on the power supply

increases, then the oscillator stops less often, right up to the moment that the oscillator is operating continuously: maximum load. If the power supply is now loaded even more, the output voltage will decay. The maximum load is determined by the maximum primary current set by R3108//3118.

Protection:
If the optocoupler would fail, the secondary voltage will increase. This would have disastrous consequences since many IC's (e.g. OTC, flash-RAM, DRAM) are fed with this 5.2 V. In other words, very expensive repairs would be required. We already know that the negative supply is directly dependent upon the secondary 5.2 V, as a consequence of which the negative supply will increase proportionally as the secondary voltage increases.
If the negative supply in the mean time reaches -30 V, D6106 will start to zener and as a consequence TS7101 will start conducting. Basically, D6106 will take over the stabilisation task of the optocoupler, however, with a considerable spread: from -20 V to -30 V is a 50 % increase, thus U_{OUT} will increase from 5.2 V to max. 7.5 V.

Main supply (diagram A1)

Some important notes on beforehand:
- V_{BAT} is not isolated from the mains supply ('hot').
- V_{BAT} is alignment free.

The Main Power Supply, generates the 141 V (V_{BAT}) and the 28 V for the audio part and is based on the so-called 'down converter' principle.

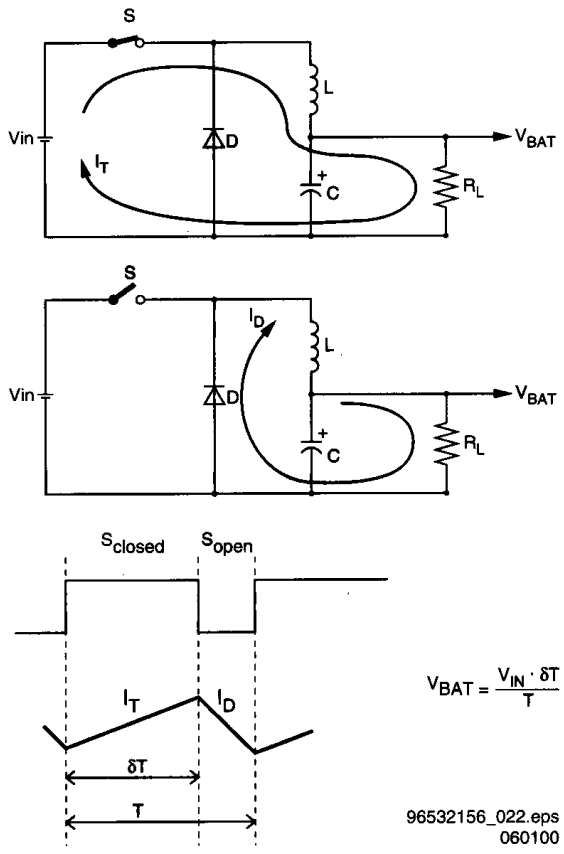

Figure 9-5

- After closing switch 'S', the linear in time increasing current I_T, , will charge capacitor C.
- Opening switch 'S' will generate a counter-e.m.f. in coil L, trying to maintain current I_T. This is possible via diode D (this diode is also called 'freewheel diode'). So after opening 'S', the magnetic energy stored in coil L will be transferred to electrostatic energy in capacitor C. The V_{IN} will only supply current during the time that 'S' is closed while a constant current is flowing through R_L.
- V_{BAT} is directly proportional with V_{IN} and the time that 'S' is closed and reverse proportional with period time 'T'. So by changing the duty cycle, it will be possible to control V_{BAT}.

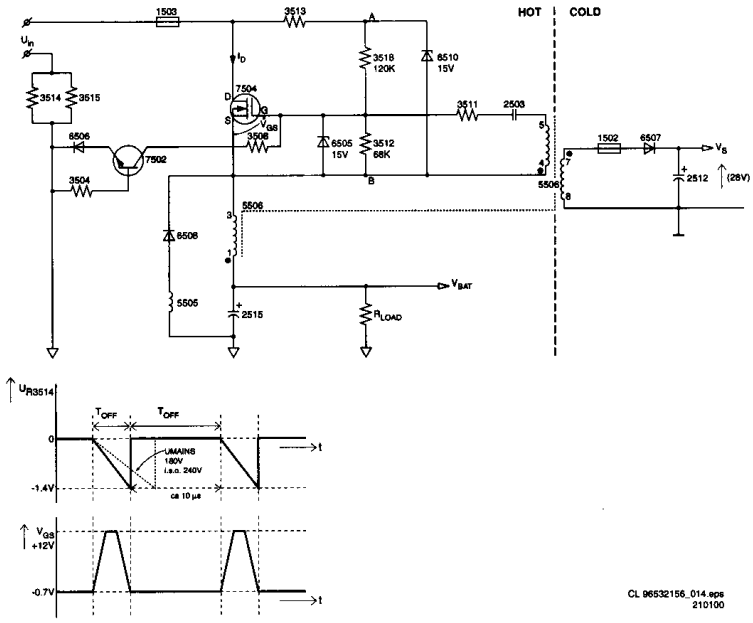

Figure 9-6

At start-up of the main supply, C2515 can be assumed as being a shortcircuit. U_{AB} will be 15 V (R3513, D6510) and U_{GS} of the FET will be +5.4 V (voltage division over R3512 and R3518). The FET will be driven into saturation (same as closing switch 'S'). The drain-current will increase linear in time. With other words: resistors R3513 and R3518 will start the oscillator. The voltage across the co-coupled coil (4, 5) is also positive and will keep the FET into conductivity.

The drain-current will also flow through R3514//R3515. The voltage on the base of TS7502 will be +0.8 V due to the stabilisation circuit (which is explained further). At increasing current, the emitter-voltage of TS7502 will get more negative. When this voltage reaches -0.7 V, TS7502 will be driven into conductivity and consequently connect the gate of TS7504 to earth; the FET will block (same as opening switch 'S'). The maximum drain-current is: 0.7 V / (R3514//R3515) = 1.4 A. The voltage polarities on L5506 will invert, keeping the gate of TS7504 negative via the co-coupled coil (4, 5). The voltage on the secondary winding of L5506 (7, 8) will be positive, generating the +28 V audio supply voltage via D6507 and C2512.

The sudden current interruption in the primary coil, will induce a counter-e.m.f. that wants to maintain the current via the 'freewheel' diode D6508. This current is linear decreasing in time and as it is also flowing through R3414//R3415, TS7502 will be blocked after a certain time period. The gate of the FET will be again made positive, is driven into conductivity and the cycle starts again.

Stabilisation of V_{BAT}:
The output voltage V_{BAT} will be determined by: $V_{BAT} = V_{IN} * T_{ON} / (T_{ON} + T_{OFF}) = V_{IN} *$ duty-cycle.
To stabilise the output voltage, a feedback loop is implemented, which will reduce T_{ON} when V_{BAT} increases and vice versa.

Via a voltage divider, excisting of (1 %) resistors R3507, R3510 and R3527, a voltage of 2.5 V (when V_{BAT} = 141 V) is fed to the input of precision shunt regulator 7506. This regulator will

conduct, a current will flow through R3524 and TS7505 will be driven into conductivity. The base of TS7502 will now be set at a certain positive voltage. As this transistor switches the FET TS7504 on and off, this circuit can determine the dutycycle.

E.g. when the load increases, V_{BAT} will decrease. As a consequence, the input-voltage of regulator 7506 will decrease, resulting in a lower current. Through that the emitter-base voltage of TS7505 will diminish.
The current through R3504 will decline, changing the base-voltage of TS7502 and through that the T_{ON} (will increase) of the FET. The output voltage V_{BAT} will rise.
If the load continues to increase, the regulator will block at a certain moment, the collector-current of TS7505 will now be zero. If there flows no current through R3504, T_{ON} will now be maximum (I_{MAX} = 1.4 A). This is the point where V_{BAT} will be below 141 V, and at further increasing load will be switched off (The voltage across the co-coupled coil (4, 5) will decrease due to the increasing load. Therefore the voltage on the gate of TS7504 comes below the threshold voltage. The supply switches off and an audible hiccuping can be heard).

On the other hand when the load decreases, V_{BAT} will rise. As a consequence, the input-voltage of 7506 will also rise resulting in a higher current. The current through R3504 will rise, changing the base-voltage of TS7502 and through that the T_{ON} (will decrease) of the FET. The output voltage V_{BAT} will be reduced.

If, for instance, V_{IN} will decrease (e.g. U_{MAINS} is 180 V i.s.o. 240 V), the slope of the drain-current will be flattened, through which the FET will be longer into conductance, keeping V_{OUT} constant.

If, for any reason, the stabilisation circuit might fail, the output voltage V_{BAT} can never exceed 200 V (via D6514). D6514 will form a shortcircuit, V_{BAT} will drop and the set will switch off (this will result in an audible hiccuping of the supply).

Set to 'STANDBY" (via RC):
When the set is switched to 'STANDBY' via the Remote Control, the Main supply will be switched off.
This is done by the circuit around TS7529 (see diagram A1):
During 'ON'-state the Main supply is fed with line pulses via the STANDBY line. They are rectified and smoothed via D6517, D6516 and C2530 and fed to TS7529. Because they are less than -20 V, this transistor will be blocked.
When these pulses are stopped (STANDBY), TS7529 will be saturated and TS7502 will be switched off. This will switch off the Main supply.

Set to 'ON' (via 'STANDBY'):
At the moment the set is switched 'ON', the HOP is not working (as much as possible IC's are made voltageless during 'STANDBY'). Therefore it is impossible that the STANDBY line carries line-pulses, so the main supply cannot start up. This problem is solved via the 'low power start-up' possibility of the HOP.
Via pin 22, the HOP receives, via the STANDBY_INFO line from the OTC, a voltage of 5.2 V coming from the Standby supply. The result will be that the HOP will generate pulses with a nominal T_{OFF} and T_{ON} growing from 0 to 30 % of the nominal value.
This signal is unchanged until the Main supply is switched 'ON' and the HOP the correct I^2C-command POR-bit) has received.

Guarding circuit:
The negative pulses on the secondary winding of L5506 are rectified by D6520 and smoothed by C2535. The resulting negative DC-voltage will keep TS7510 blocked, even as TS7511.

When something happens in the Main supply through which these pulses will decrease, the DC-voltage will increase. TS7510 starts to conduct, even as TS7511. Via R3541 and D6522 this situation will be maintained (thyristor principle). The collector of TS7511 drives via R3538 a positive pulse back to the OTC (named STANDBY(POR)). The OTC will now switch off the Main supply via the STANDBY_INFO signal.

SSB

There are 5 different voltages located on the SSB: +33 V, +11D V, +8 V, +5.2 V and +5 V.
+5.2 V is the Standby voltage, it should always be present. The 8 V is derived from the 11D V with stabiliser 7906. The 11D voltage is only present when the line-drive pulses start the deflection.
The 8 V is used to switch the +5.2 V with transistor 7905 to supply the +5 V.

9.1.4 Control (diagram B5)

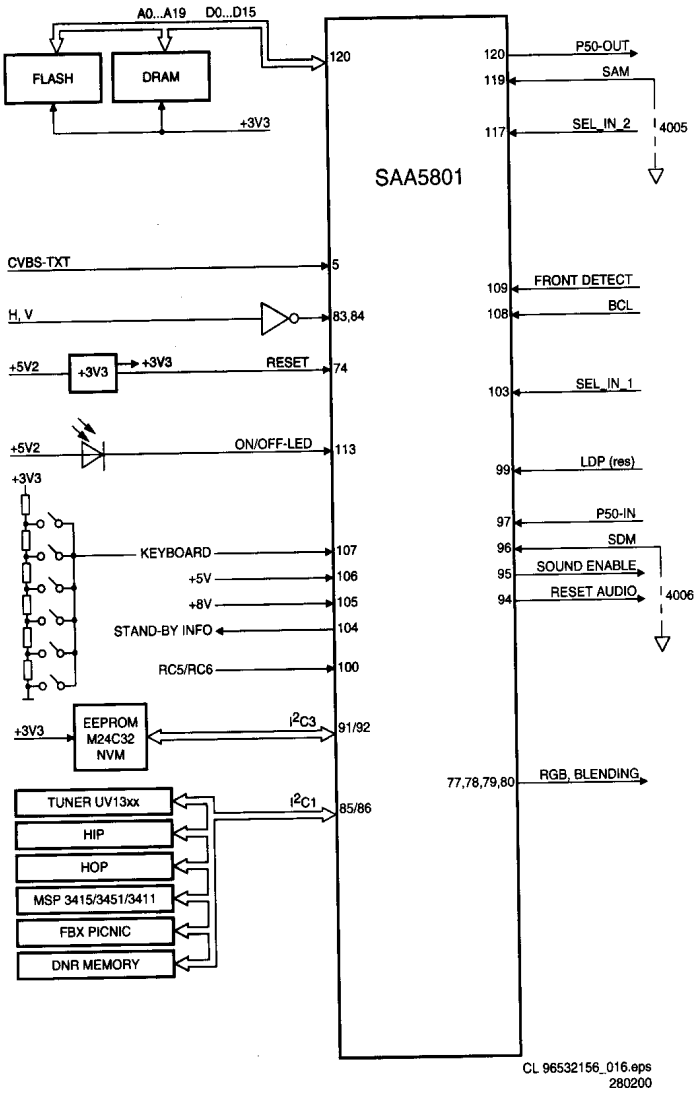

Figure 9-7

OTC

The SAA5801 (IC7001) is called the OTC (OSD, TXT and Control). In this IC, the microprocessor and the TXT-decoder (level 2.5) are integrated.
Some of its functions are:

- Set control.
- TXT/OSD acquisition.
- RGB-outputs to the HOP
- Menu blending; for blending the contrast is software controlled.
- I/O-ports for I^2C, RC5, LED, and service modes.
- Error code generation.

The software for EM2E can be 2 MB (Megabyte).
For TXT-data 1000 pages can be stored in IC7007. This is a DRAM of 4 Mbit and this IC is also used to store data of a working set.
The Non Volatile Memory IC7011 is a 4 kB version M24C32W6.

All ICs in this part are supplied with 3V3. For this voltage a 3V3 stabiliser is used (IC7005).
When the 3.3 V is available, a POR is generated with TS7003/7004 to wake up the OTC. During the reset all I/O pins are high. When a POR is generated the TV-set is in Standby mode.

Via pins 105 and 106 the 8 V and the 5 V are sensed. If one of them is not present, the Main supply is switched off (set in protection and the red LED will blink at 3 Hz). The OTC will generate an error code to indicate what was wrong.

The horizontal (HD100) and vertical (VSYNC) sync pulses are also fed to the OTC for stable OSD and TXT.

The RGB-outputs (77/78/79) together with fading (pin 80) are fed to the HOP. The fading pin has a double function: it is used for making a transparent menu and as fast-blanking signal for TXT.

I^2C-busses

In the EM2E-chassis with OTC-processor there are two I^2C-busses used:

- Slow (max. 100 kHz) hardware I^2C-bus (called I^2C1), used for all IC communication.
- Separate short bus (called I^2C3) for the Non Volatile Memory (NVM) to avoid data corruption.

NVM

The Non Volatile Memory contains all set related data that must be kept permanently, such as:

- Software identification.
- Operational hours.
- Error-codes.
- Option codes.
- All factory alignments.
- Last Status items for the customer + a complete factory recall.
- Txt featuring (keeping habit watch data).
- EPG data.

9.1.5 Tuner & IF (diagram A7 & B2)

The tuner UV1316 is I^2C-controlled and is capable of receiving off-air, S- (cable) and Hyperband channels:

- Low 44 - 156 MHz
- Mid 156 - 441 MHz
- High 141 - 865 MHz

The tuning is done via I^2C. The reference voltage on pin 9 is 33 V. This voltage is derived from the 180 V (from the LOT) via a resistor of 120 kΩ and a zenerdiode. The OTC together with the HIP control the tuning procedure. There is also automatic switching for the different video systems.

The IF-filter is integrated in a SAW (Surface Acoustic Wave) filter. The type of this filter is depending of the standard(s) that has to be received. Two SAW filters are used: One for filtering picture-IF and the second-one for sound-IF. An extra filter (5403), tuned at 40.4 MHz, is necessary for L/L' sets with 6.5 MHz sound to suppress the neighbour channel.

The output of the tuner is controlled via an IF-amplifier with AGC-control. This is a voltage feedback from pin 62 of the HIP to pin 1 of the tuner. AGC take-over point is adjusted via the service alignment mode 'Tuner AGC'. If there is too much noise in the picture, then it could be that the AGC setting is wrong. The AGC-setting could also be mis-aligned if the picture deforms with perfect signal. The IF-amplifier amplifies too much.

The video IF-signal is fed to pins 2/3 of the PLL-controlled IF-demodulator. The voltage controlled oscillator of the PLL is adjusted via the service menu 'IF AFC'. If the alignment is correct then the displayed frequency in the installation menu is the same as the applied frequency from a generator. The external coil L5408 connected between pins 7/8 is used as reference. The demodulated IF-video signal is available at pin

10 of the HIP. In this video signal there is a rest of sound carrier, which is filtered by the sound trap 1407.
Then the signal is again fed to the HIP on pin 12 where the group delay can be corrected, dependent on the standard that is received. On pin 13 the CVBS-signal becomes available which is used for further processing in the television. Via TS7322 the signal is supplied to EXT1 and back into the HIP on pin 14 to the source/record selection.

To realise quasi split sound the IF-signal is fed to the HIP on pin 63/64 via SAW-filter 1405. The FM (or AM for L-norm) - modulated signal is available on pin 5 and is fed to the audio demodulator MSP34xx.

9.1.6 Video: High-end Input Processor (HIP, diagram B2))

In the EM2E the TDA932xH input processor is used, which contains the following functions:
- IF demodulation.
- Group delay correction.
- AFC signal generation, used to track drifting transmitters.
- Sound carrier re-generation (SIF).
- AM demodulation.
- Sync acquisition, delivering HA and VA.
- Switching off IF-filtering.

The HIP has various inputs.
- Full matrix switch with:
  - 2 CVBS inputs
  - 2 Y/C (or additional CVBS) inputs
  - 1 CVBS front end input
- Two RGB inputs and 2 status-inputs

Outputs: Three separate switchable outputs can be used:
- 1 YUV-output is fed to the PICNIC
- 2 CVBS outputs: One for Teletext Dual Screen and the other for output to EXT2 to have WYSIWYR (What you see is what you record)

I/O-switching: The external signals are fed directly to the I/O part of the HIP with status from pin 8 of SCART. On the HIP there are two status inputs available (pins 15, 17) with two voltage levels:
- 4:3 -> 2.2 V
- 16:9 -> 5.5 V

The input signals from the Front I/O are fed to the HIP and front detection is also fed to the OTC.
EXT1 is full SCART: thus CVBS and RGB. The RGB-selection is done in the HIP.
EXT2 is meant for VCR and has therefore some additional signals in relation to EXT1 but no RGB. EXT2 has also the possibility for Y/C_in and Easylink-Plus (P50). Y_in is with pin 20 and Chroma in with pin 15. Easylink is handled via pin 10 of the SCART and this is a bi-directional communication.

Easylink supports the next features:
- Signal quality and aspect ratio matching
- One touch play
- One touch text
- PIP
- Pre-set download
- WYSIWYR
- Automatic Standby

With Easylink-Plus is added:
- Country and language installation
- System Standby
- Intelligent set top box features
- NexTView download
- Timer record control
- VCR control feature

Video processing
The sandcastle-pulse of the HIP will not be used for synchronisation. The HOP will generate synchronisation signal derived from the feature box (PICNIC) signals. If a VCR is connected, there is also an automatic correction for Macrovision. This is active for the external sources and the pre-sets 0, 90-99.
The HIP itself (no external voltage) controls the Y/C switch in the HIP.
The chrominance decoder in the HIP is full multistandard: PAL/SECAM/NTSC.
Two different crystals can be connected to the pins 54 & 57 without any alignment. The crystals are also used as a reference for the synchronisation. A digital control circuit that is locked to the reference signal of the colour decoder determines the start-up of the sync. This crystal may only be replaced by the original one. If just a crystal is taken, the internal capacitance will be different and the effect will be that there is no colour.
In the HIP a sync separation has been integrated; the HIP delivers the HA and VA 50Hz/60Hz to the PICNIC. On pin 59 there is the 1fH sandcastle but this is not connected to any circuit and only used internally for the colour demodulator. The 2fH-sandcastle signal is generated by the HOP.

9.1.7 Video: Feature box (PICNIC, diagram B3))

Introduction
The basic function of the Feature box (FBX6) is picture improvement, and depending on the version, several scan conversion methods can be applied. The PICNIC (SAA4978H) is the central key component.
In the EM2E-chassis the featurebox is integrated on the SSB.
The PICNIC is used for the 100Hz conversion. In the PICNIC the following functions are present:
- The ADC.
- The DAC.
- The 100 Hz conversion.
- The Panorama mode.
- The noise limiter (DNR).
- The contrast improvement.

All these functions are integrated in one IC: SAA4978H, 160 pins QFP

ADC/DAC
Analogue to Digital conversion is done with three identical 9-bit ADC's.
Digital to Analogue conversion uses three identical 10-bit DAC's.
In the PICNIC there are three 9 bits ADCs present for Y,U,V. For digitising the Y (luminance) 9 bits are used, to realise a more detailed picture. The 9 bits are only internally used. Via dithering the 9 bits are reduced to 8 bits and that data is stored into the memory. The data in the memory is fed back to the PICNIC and via undithering the data is again reproduced 9 bits for processing.
U/V (colour difference signals) is also sampled with 9 bits. These two 9 bit data streams are multiplexed to 4 bits data streams. This reduction can be allowed, as the perception for colours by the human eye is less sensitive as for luminance.

100 Hz conversion
The main task of the PICNIC is the conversion from 50Hz to 100Hz for YUV and HV-sync. In order to remove 'large area flicker' (especially visible in a white picture), the field-rate of the video is doubled by the FBX6. A 50/60 Hz frame frequency is converted to 100/120 Hz. Also the line frequency (16 kHz) is doubled (32 kHz). Basically, when the video input contains fields A, B etc..., the conversion provides an AABB sequence on the display. The actual conversion is done in the first Field Memory by reading it twice at double speed, while writing it once.

PROZONIC

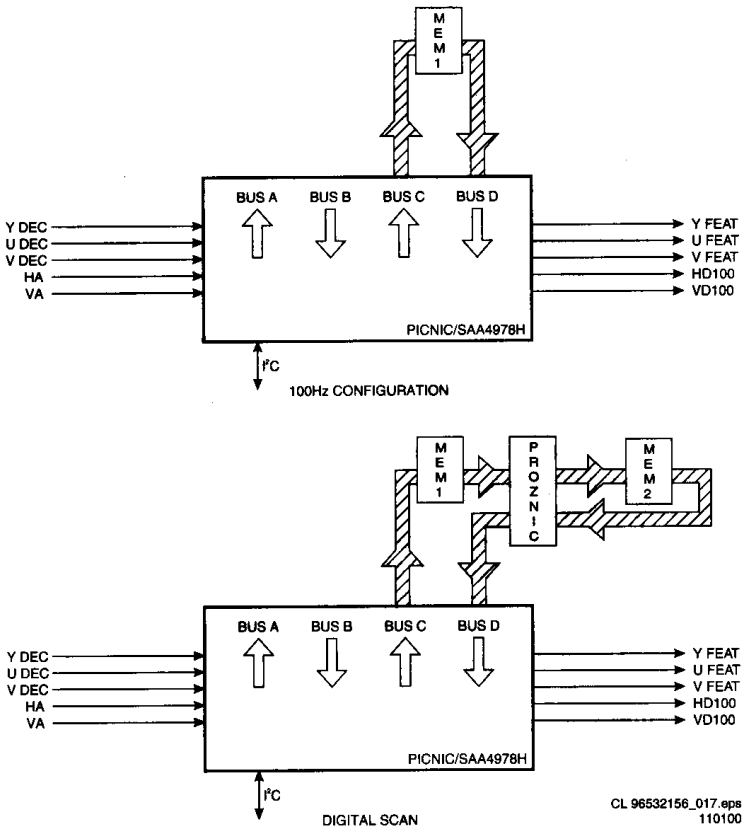

Figure 9-8

To the PICNIC external IC's are connected dependent of the features.
If EM2E has only 100Hz then only one memory-IC is used to store one frame.
For sets with Digital Scan the PROZONIC (IC7708, SAA4990H) has been added with two memory-ICs (IC7714/7715). It is an abbreviation for PROgressive scan Zoom and Noise reduction IC.
When applying this, the 2nd Field Memory has to be installed.
The following functions are available:

- Line flicker reduction (Digital Scan): this is a feature to reduce the 25 Hz interlace line flicker.
- Dynamic Noise Reduction: noise affected signals can be improved by combining the pixel values of the current and past video fields. This is however only possible in areas without movement.
- Variable Vertical Sample Rate Conversion
- Synchronous No Parity Eight bit Reception an Transmission interface (SNERT-bus)

Depending on the chassis model, the FBX6 can have the following specification:

Featurebox 6 diversity	
Set	Chipset
EMG 1fH	
EMG 2fH	1 Memory
EMG 2fH DNR	1 Memory incl. DNR
EMG 2fH Dig. Scan	PROZONIC + 2 Memories

Dual Screen compression
The PICNIC can provide horizontal video compression up to 50 %. The compress mode can be used to display dual screens for instance with Teletext (only for widescreen sets).

Panorama
To fit 4:3 pictures into a 16:9 display, a panoramic horizontal distortion can be applied to make a screen-fitting picture without having black sidebars or lost video.
The centre horizontal gain is programmable and the side gain is automatically adapted to make a screen-fit.

Automatic Aspect Ratio Adaptation (AARA)
This feature uses data from the 'black bar detection circuit' to adapt the vertical and horizontal amplitude to an aspect ratio belonging to the display without showing the black bars.

CTI
At CVBS video signals, the bandwidth of colour signals is limited to 1/4 of the luminance bandwidth. Transients between areas of different colours are therefore not very sharp. The PICNIC can steepen these transients artificially with a time manipulation algorithm.

Dynamic Contrast
To make the contrast (black/white) range wider, Philips has invented Dynamic Contrast. It uses the digital memory used in 100 Hz sets. It measures every A-field (25x/s) and digitally analyses where on the greyscale most of the image is located. If it's a relatively dark image, the lighter part of that image is stretched towards white, so that more contrast will become visible in that picture. If it's a relatively light image, the darker part of that image is stretched towards black, so that these darker parts will have more contrast. When the image is in the middle of the greyscale, both dark and light parts are stretched.

9.1.8 Video: High-end Output Processor (HOP, diagram B4)

General
In the HOP (High-end Output Processor, TDA9330) the video processor and digital deflection processor are integrated. The main functions of the HOP are:

- Video control (contrast, brightness, saturation, etc.).
- 2nd RGB interface for OSD/TXT.
- Peak White Limiting.
- Cut-off control and White Drive (RGB outputs).
- Geometry control.

The YUV-signals from the PICNIC are fed to the HOP. In the HOP, the video and geometry control parts are integrated. Also the RGB-signals from TXT/OSD are inserted via the HOP. This IC has all functions from a video processor and geometry control (like the DDP in MD2). The geometry part delivers the H-drive, EW-drive and also a drive signal for rotation. The internal V-drive circuit of the HOP is not used (is explained further on).

Video Control
After conversion to RGB again, the signals can be controlled for Saturation, Contrast and Brightness.

2nd RGB interface for OSD/TXT
On pins 35 - 38 the RGB and fast blanking from the OTC (OSD and TXT) are inserted.

Peak White Limiting
On pin 43 there is a Peak White Limiting signal line (PWL). If the beam current (EHT-info line) increases, then the EHT-info voltage will decrease. PWL is controlled by average limiting via R3343/C2333.

Cut-off control
Switching the TV to Standby:

1. Vertical scan is completed.
2. Vertical flyback is completed (the horizontal output is gated with the flyback pulse, so that the horizontal output transistor cannot be switched on during the flyback pulse).
3. Slow stop of the horizontal output is started, by gradually reducing the 'on' time at the horizontal output from nominal to zero (this will take 50 ms).

4. At the same time the fixed beam current is forced via the black current loop for 25 ms. This is done by setting the RGB outputs to a maximum voltage of 5.6V.

In the EM2E a 'one-point' cut-off control is used:
A current of 8 µA (for cut-off) is fed to pin 44 of the HOP. This is done with a measurement pulse during the frame flyback. During the 1st frame, 3 pulses are generated to adjust the cut-off voltage at a current of 8 µA.With this measurement the black level at the RGB-outputs is adjusted. So at start-up there is no monitor pulse anymore. At start-up, the HOP measures the pulses which come back via pin 44. The RGB-outputs have to be between 1.5 V and 3.5 V. If one of the outputs is higher than 3.5 V or one of them lower then 1.5 V, the RGB-outputs will be blanked.

Geometry control
All geometry control is done via I^2C and the data is stored in the NVM (IC7011) of the SSB.

Line drive (LINEDRIVE1).
Line drive is derived from an internal VCO of 13.75 MHz. As a reference an external resonator is used (1301). The internal VCO is locked with the HD100-pulse, which comes from the PICNIC. The 'PHI-2' part in the HOP receives the HFB_X-RAY_PROT (pin 13) to correct the phase of the line drive. The EHT-info is supplied to pin 14 (DYN-PHASE-CORR) to compensate picture breathing depending on the beam current. Service tip: This is not used at the moment, therefore EHT-compensation in the service menu is put to zero.

Frame drive (FRAMEDRIVE+).
The VD100 signal from the PICNIC will be extended for 16.5 lines by the circuit around TS7309 and 7311. The resulting signal (VDHOP) will drive TS7310. This will result in the (asymmetric) FRAMEDRIVE+ signal.
Note: The Frame outputs (pins 1/2) of the HOP are not used!

East/West drive.
At pin 3 the E/W-drive is available. Pin 4 is a feedback input for the EHT-info and is used to prevent pumping of the picture. EHT varies also dependent of the beam current. For widescreen without load this is 31.5 kV and with load (1.5 mA) 29.5 kV.

Frame rotation (only for 16:9 sets):
For frame rotation a control voltage is used from pin 25 of the HOP. This voltage can vary from 0.4 V till 4 V.

Guarding protections:
- Flash detection:

When a flash occurs, the EHT-info will become negative very fast. Via D6303/D6304/R3316, TS7303 starts to conduct. This makes pin 5 of HOP high. When pin 5 of HOP is high, then the output (pin 8) is immediately stopped. If H-drive stops then also pin 5 will be low again, which will reset the flash detection. A bit (FLS) will be set in an output status register, so via the OTC it can be seen when there was a flash. This FLS-bit will be reset when the OTC has read that register.
- HFB protection:

If the HFB is not present then this detected via the HOP. The OTC puts the TV into protection and reads a register in the HOP. An error code will be generated.

9.1.9 Synchronisation (diagram B3 & B4)

The HIP video processor provides vertical and horizontal sync pulses VA and HA that are synchronised with the incoming CVBS signal. These pulses are fed to the PICNIC where they are doubled to be synchronous with the 100 Hz picture. The outgoing pulses, VD100 and HD100 are fed to the HOP that supplies the vertical and horizontal drive pulses and the 100 Hz (2fH) sandcastle pulse.

The VD100 pulse from the PICNIC is only one line long. Therefore this pulse is converted into a VDHOP signal by a 530 µs monostable oscillator (extended by 16.5 lines). This signal is on block function level equal to VSYNC and FRAMEDRIVE+.

The OTC is synchronised on the HD100 pulse from the FBX and on the VSYNC for the synchronisation of TXT/OSD/EPG

When no CVBS is offered to the video processor, the VA and HA pulses are switched off by the HIP, and the VD and HD pulses are then generated by the PICNIC. This to assure a stable OSD.

9.1.10 Horizontal (line) deflection (diagram A3)

Driving the line output stage

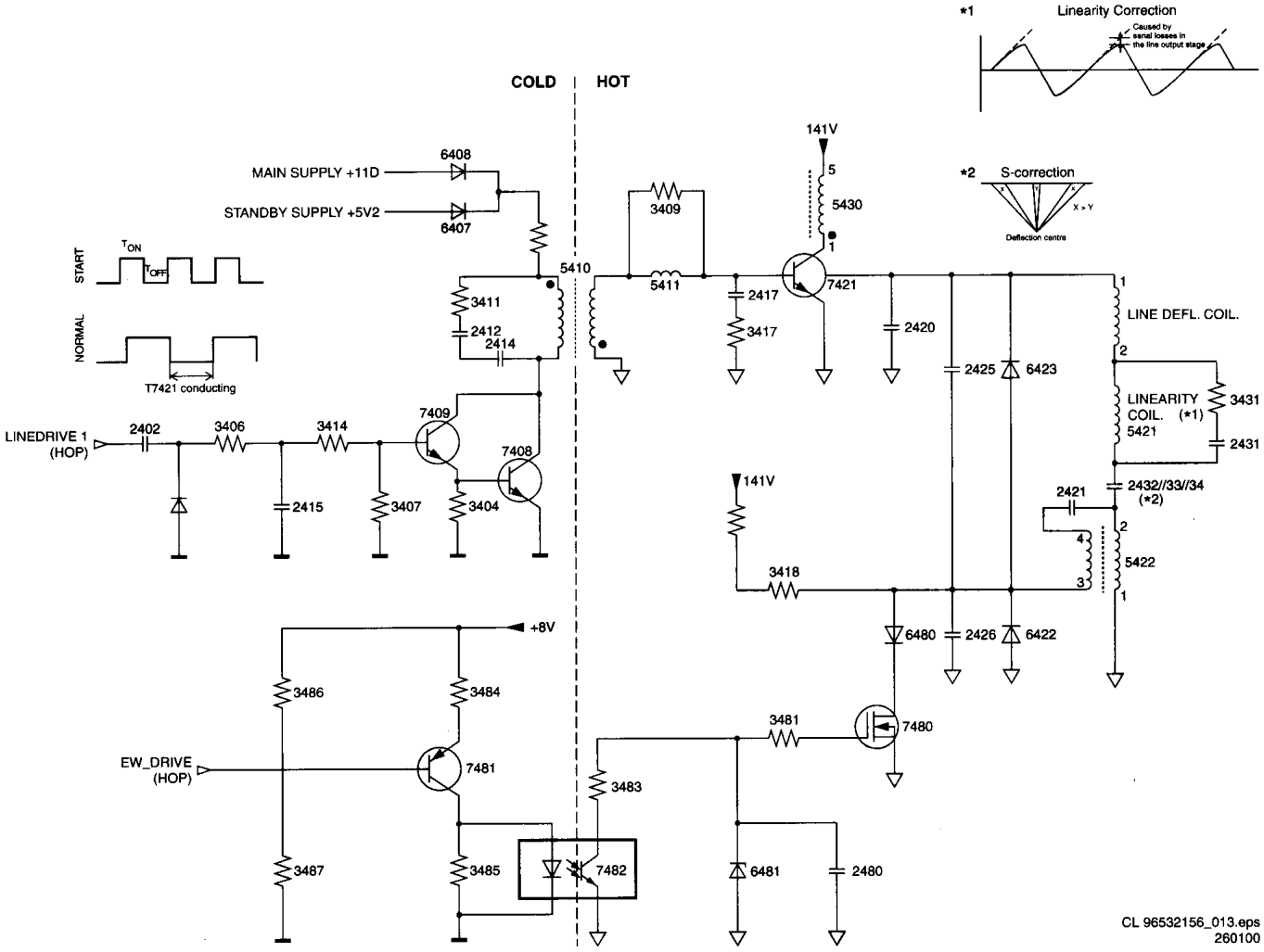

Figure 9-9

The HOP (located on the SSB) generates the line-drive pulses (LINEDRIVE1), which have a frequency of 31250 Hz (T = 32 µs).

When the LINEDRIVE1 signal is high, TS7409 and TS7408 will conduct. A constant DC voltage will be applied across L5410, causing a linear increasing current through this coil. The secondary voltage of L5410 has a negative polarity so that TS7421 will block. When switching on the set, the current through L5410 is supplied by the 5V2 Standby supply (via D6407), and taken over by the +11D voltage (via D6408) of the main supply.

When the LINEDRIVE1 signal becomes low, TS7409 and TS7408 will block. The voltage polarity across the primary winding of L5410 will invert. The positive voltage on the secondary winding will now drive TS7421 into conductivity. Because of the storage time of the line transistor (TS7421), L5410 cannot transfer its energy immediately to the secondary side. This may result in high voltage peaks on the collector of TS7409 and TS7408. To prevent that these peaks will damage the transistors, a 'snubber' circuit (C2414, C2412 and R3411) will suppress them.

When the LINEDRIVE1 signal is high again, the above-described sequence starts again. Circuit L5411 and R3409 will increase the switch-off time of the line transistor.

The line stage will be started via the 'slow start' principle. During start-up, the HOP generates line drive pulses with a small T_{ON} and a high frequency (50 kHz); T_{OFF} will be constant and T_{ON} will be gradually increased until the duty-cycle is 50 % (normal condition). The time interval from start to normal condition takes about 150 ms. When switching off, the same procedure is followed, but now in reverse order.

Operation of the line output stage

To explain the operation of the line output stage, we use the following start conditions:

- C2433 is charged to max. 141 V (V_{BAT})
- TS7421 is driven into conductivity.

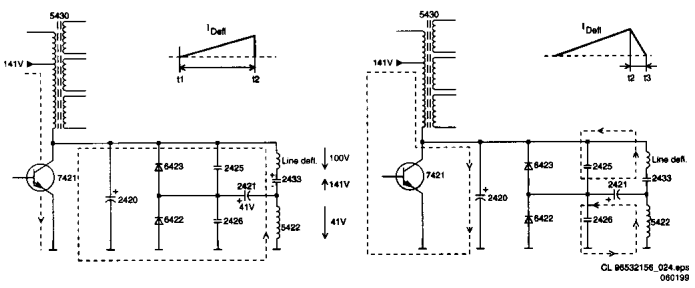

Figure 9-10

Period t1 - t2:
When TS7421 is driven into conductivity, the capacitor voltage of 141 V, will be divided across bridgecoil L5422 and the deflection coil (conn. 0317). Due to the chosen inductance values, there will be 100 V across the deflection coil and 41 V across L5422. The linear increasing current in the deflection coil will result in a spot moving from the centre of the picture tube to the right.
The voltage across L5422 will also charge C2421 (41 V - 0.7 V).

Period t2 - t3:
At the moment the LINEDRIVE signal becomes high, TS7421 will stop conducting. In the coils a voltage will be induced, trying to maintain the current. The current through the line deflection coils continues to flow through C2425 and C2421 and the current through L5422 continues to flow through C2426 and C2421. The energy stored in the line deflection coil is passed to C2425, and the energy of L5422 to C2426.
The resonance-frequencies of these 2 LC-circuits define the flyback time of the spot from the right side of the picture tube to the left.
On average no current flows through C2421 and thus the voltage across this capacitor remains constant.

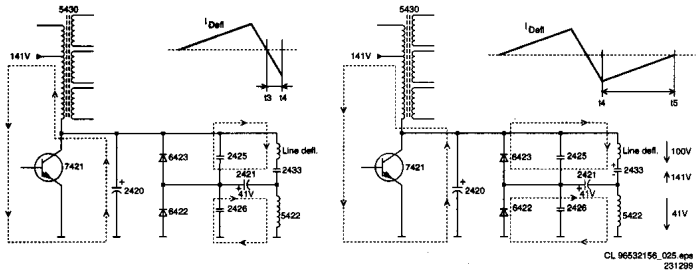

Figure 9-11

Period t3 - t4:
As for the period t2 - t3; but now the current flows in the opposite direction, since the voltage across C2425 and C2426 is higher than the voltage across C2433 and C2421.

Period t4 - t5:
The coils want to maintain the negative current and will charge the capacitors negative. Because of this, D6422 and D6423 will conduct. The voltage is 100 V across the deflection coil and 41 V across L5422. As both diodes conduct, we may consider the voltage to be constant. A linear current flows with the same changing characteristics as in period t1 - t2. The spot now moves from the extreme left of the picture tube to the centre. Before the current becomes zero, and the spot is located in the centre of the frame, TS7421 reverts back into conductivity. First a short negative current will flow. The cycle starts again.

The linearity correction
A constant voltage across the horizontal deflection coil should result in a linear increasing saw-tooth current. This however is not the case as the resistance of the coil is not negligible. In order to compensate for this, a pre-magnetised coil L5421 in series with the deflection coil is used. This coil ensures that during time interval t1 - t3 the circuit-resistance will be higher than during t4 - t5. L5421 is called the linearity coil.
To avoid self-oscillation, R3431 and C2431 are placed parallel to L5421.

The S-correction
Since the sides of the picture are further away from the point of deflection than the centre, a linear saw-tooth current would result in a non-linear image (the centre would be scanned slower than the sides). To solve this, the deflection current for the right- and left side will be reduced.
C2433 is charged quadratic during time interval t1 - t2. Left and right the voltage across the deflection coil decreases, causing the deflection to slow down. In the centre, the voltage increases and the deflection will be faster. An S-shaped current will have to be superimposed onto the saw-tooth current. This correction is called finger-length correction or S-correction. C2433 is relatively small, as a result of which the saw-tooth current will generate a parabolic voltage with negative voltage peaks.. The current also results in a parabolic voltage across C2421, resulting in the finger-length correction, proportionally increasing with the picture width. The EW-DRIVE signal will ensure the largest picture width in the centre of the frame. Here the largest correction is applied. The larger the picture width, the higher the deflection current through C2433.

The E/W-correction
A line, written at the upper- or lower side of the screen, will be larger at the screen centre when a fixed deflection current is used. Therefore the amplitude of the deflection current must be increased when the spot approaches the screen centre. This is called East/West correction.
The EW-DRIVE signal is generated in the HOP and will drive FET TS7480 via TS7481 and optocoupler TS7482. TS7480 will charge capacitor C2423 more or less, increasing the deflection current when reaching the centre of the screen.

Secondary line-voltages
During the blocking time of TS7421, the magnetic energy of coil 1 - 5 of the LOT will be transferred to electrical energy in the secondary winding. Via rectifying and smoothing, the several secondary supply voltages will be generated:
- EHT, Focus and Vg2-voltage
- +180V for the CRT panel (pin 8 LOT)
- +11D for the line deflection (pin 12 LOT)
- +13VLOT for the frame deflection (pin 6 LOT)
- -15VLOT for the frame deflection (pin 3 LOT)
- Filament voltage (pin 9 LOT)

The EHT-INFO signal is derived via R3450//R3451. This signal decreases while the beam current increases. It is fed to the HOP to compensate for loss of picture width and picture height.

The DYN-FASE-CORR signal is fed to the HOP via C2455 and drives a dynamic phase correction necessary because of beam current variations. This is done by regulating T_{ON} of the line transistor TS7421.

East-West circuit
The moment TS7480 is driven into saturation, C2421 will discharge during the flyback. As a consequence of which C2421 must be charged again during the scan via the conduction diode D6422 (as long as C2421 is not charged to the voltage across L5422, D6422 will conduct). The current in the deflection coil is therefore larger than the current flowing in L5422 (1-2). The voltage across the deflection coil increases, so the picture width increases. When TS7480 blocks, C2421 will not discharge anymore and the voltage across C2421 will remain constant. The result is that the voltage across the deflection coil is minimal. The voltage across coil L5422, however, is maximal. This coil (L5422) consists of a transformer:
- As the current through the coil 1-2 increases (smaller picture width), the current through coil 3-4 decreases. Because of the transformer characteristic a higher voltage will be subjected to coil 3-4, which will counteract the current. The current will diminish even further.
- When the current through coil 1-2 diminishes (larger picture width), the current through coil 3-4 increases.

The EW Drive

The EW drive signal originates in the HOP and is supplied to TS7480. The shape of this signal determines the various geometric correction parameters:

- H amplitude
- EW-parabola
- EW-corner
- EW-trapezium
- Horizontal parallelogram
- Horizontal bow

Beam current correction

The EHT-info at point 10 of the LOT is dependent on the value of the beam current and the voltage divider R3450, R3451 and C2450. The EHT-info is fed to the HOP to trim the contrast and to compensate for the changes in picture-width as a function of the EHT-info, when the high-voltage is decreased. The EHT-info is integrated via C2450 and sent to the gate of the E/W FET (TS7480) as a DC-voltage to correct the EW-current.

9.1.11 Vertical (frame) deflection (diagram A4)

Driving the frame output stage

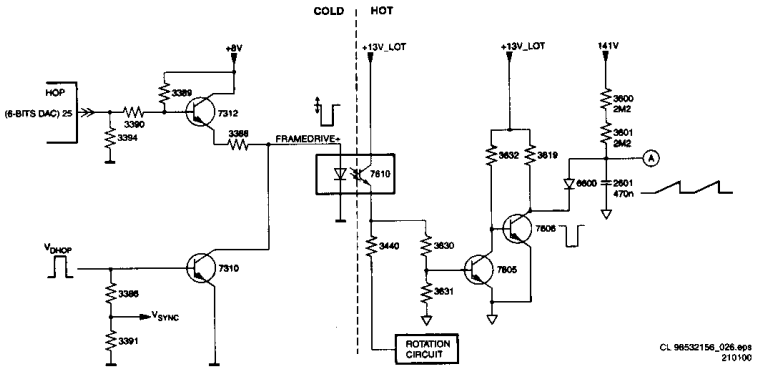

Figure 9-12

The HOP drives the frame output stage. As the HOP is 'cold' and the frame output stage is 'hot', they must be galvanic isolated by means of an optocoupler. In the MG-chassis the HOP generates 3 signals needed for the frame output stage: VDPOS, VDNEG and FRAME ROTATION. To avoid the costs of 3 optocouplers, the frame drive pulse and rotation DC-voltage are added together and then fed to optocoupler TS7610.

This is done as follows: The VD100 signal from the PICNIC (diagram B3 pin 19) is extended for 16.5 lines and inverted via a monostable multivibrator (TS7311 & TS7309, diagram B4). The output signal VDHOP is then superimposed on a DC-voltage from pin 25 of the HOP. The resulting signal is called FRAMEDRIVE+ and is fed to optocoupler 7610 (diagram A4). So this signal contains info for both the frame deflection and the frame rotation.

The circuit around IC7440 will amplify this signal and the output current will flow through the rotation coil. The vertical pulses on this signal are filtered by C2445 to ensure that only a DC-voltage will be supplied to the rotation coil.
The output voltage of the rotation circuit is between -8 and +8 V.

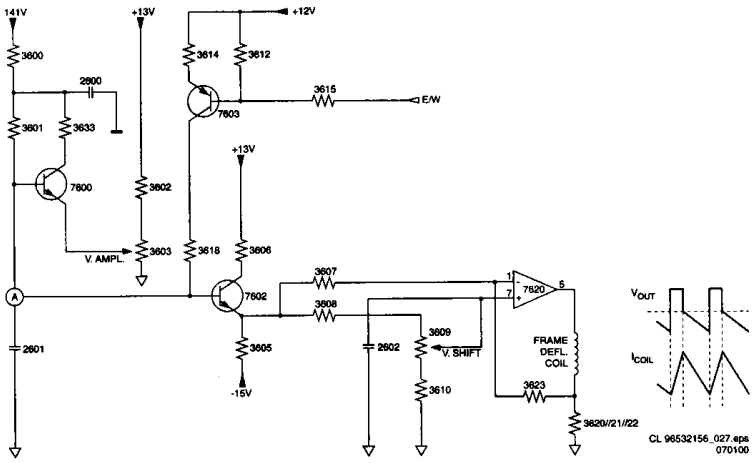

Figure 9-13

The sawtooth voltage for the frame output stage is not generated by the HOP but by a discrete circuit after the optocoupler 7610: via R3600 and R3601 a linear increasing voltage over C2601 is built up with a large time constant.

The circuit around TS7603 is a current source, driving C2601 with a current value derived from the E/W modulator. This will result in an S-shaped voltage on C2601 (also known as EW-correction).

Flyback generator

The frame output stage is supplied via the +13 V and -15 V coming from the LOT. The output of the amplifier is 0 V_{DC}, so a coupling capacitor is not required.

During the (forward) scan, a supply of +13 and -15 V is sufficient to respond to the slow changing current. The flyback generator puts a voltage of -15 V on pin 3. Because of the voltage drop over zenerdiode D6622 (8.2 V), C2622 will be charged to 19 V: being 13 + (15 - 8.2 - 0.7) V.
During the flyback scan, the change in current per time is much larger, so a higher voltage is required. The flyback generator will now generate a voltage of +13 V on pin 3. Added to the charge on C2622 this will give a flyback voltage of 32 V (depending on the CRT size, this value can differ).

The IC amplifier (IC7620, pin 5) supplies the sawtooth current to the frame deflection coil. The current through this coil is measured via R3620//R3621//R3622 and fed back to the inverting input of the amplifier.
R3624 and C2624 on the output of the amplifier, form a filter for high frequencies and in that way also prevents oscillations. Peak voltages on the output, e.g. as a result of a possible flash, are damped by the clamp circuit consisting of D6619, C2627 and R3627. The network consisting of R3625, R3629 and C2629 form an extra damping circuit.

Protection circuit for bridge-coil and frame output stage

The secondary voltage of bridge coil L5422 is guarded at the diode modulator (D6421/22) via a detection circuit consisting of an 8.2 V zenerdiode (diagram A3). When the bridge-coil is working properly, the average voltage on D6422 is such that this zenerdiode will conduct and will drive TS7652 into saturation via the BRIDGE_PROT signal (see diagram A4). When, for any reason, the secondary side of the bridge-coil is shorted, the average voltage on D6422 will drop below the zener-voltage and TS7652 will block. Now capacitor C2642 will be charged. Transistor TS7407 will start conducting and the STANDBY signal will be grounded via R3403. This will switch off the main supply (see diagram A1).

Via the circuit built around TS7641 the frame output stage is guarded. If the frame output stage is working properly, TS7641 and TS7652 will both conduct and thereby discharging C2642. TS7407 is blocked now, causing the STANDBY signal to be high-ohmic.
If there are frame pulses missing, TS7641 will block and capacitor C2642 can be charged. Transistor TS7407 will now start conducting and the STANDBY signal will be grounded via R3403. This will switch off the main supply (see diagram A1).

9.1.12 Audio (diagram B6, A5 & A6)

Introduction
All EM2E sets contain one of ITT's Multistandard Sound Processing IC's for sound decoding. The diversity arises because each member of the MSP-family handles its own set of sound standards:

- MSP3415D: Europe & AP decoding, Stereo incl. NICAM.
- MSP3451G: Global decoding, Virtual Dolby.

This IC takes care of the main FM sound decoding. AM decoding for the L system is done by the HIP. The demodulated L sound is then again source selected and processed in the MSP. The reason for this is the bad AM detection performance of the MSP. In case of NICAM L however, this is handled by the MSP.

All MSP versions contain digital audio processing, used for the basic left/right stereo sound, such as bass, treble, balance, incredible sound and spatial. In addition to that, the MSP3451 is also able to perform Virtual Dolby, a Dolby approved sound mode for surround sound reproduction with left/right speakers only.

Audio source selection

- MSP3515D (stereo)

This IC is an economised version of the MSP3410 that is used in the MG-chassis. It can cover 2 stereo and 1 mono (AM) input. Since more inputs are required, a separate source selector is used (HEF4052, IC7675). This selector has EXT1, EXT2, FRONT and SC1-OUT (Tuner) as input and is connected to the SCART1 input of the MSP3415. The SCART2 input is not used.

Since the MSP3415 has only one SCART output, which is connected to the SCART1, a constant level output and connection to SCART2 is not available. This is fixed by connecting the HEF4052 input selector to the constant level output and to SCART2 via a so-called 'Régimbeau' switch (IC7652).
This switch is needed to prevent feedback (Larsen effect). When EXT2 is chosen as input signal, and the output of SCART2 is selected, this means that the main picture is also EXT2 and will cause the Larsen effect. To prevent this, the record select must be switched to Tuner. This is especially important when decoders are used, behind a 'transparent' VCR connected to EXT2.

To get a constant level output if the Tuner is selected, the SCART1 output (Tuner at any time), has to be fed back to the input selector and selected as input for the MSP (SCART1 input).

The MSP3415 has no separate output to drive a headphone. The headphone is therefore hardwired (on the LSP) to the main sound output.

- MSP3451G (Virtual Dolby)

The MSP3451, which is used in all versions supporting Virtual Dolby, is capable of supporting 4 stereo inputs and 1 mono (AM) INPUT. Therefore the extra input selector (HEF4052) is not needed.

The MSP3451 is also capable of supporting 2 SCART outputs, so the trick used in the MSP3415 set-up to get a constant level output is not needed.

The MSP3451 has a separate headphone output, so sound control be done separate from the speakers.

Audio decoding
At the input a choice can be made between two IF-signals; SIF and SIFM.
The selected signal is fed to the AGC. After this, an ADC converts the IF-signal to digital.

This digital signal can be processed by 2 demodulation channels. The first one is able to handle FM and NICAM signals. The second one can handle FM and AM signals.

Each channel contains a mixer to shift the incoming signal in the frequency domain. This shift is determined by the value of a DCO.

After the down-mix, the signal is fed, via a filter, to a discriminator. From here the AM, FM or NICAM demodulation can be performed.

Both channels contain an 'automatic carrier mute' function, which automatically mutes the output of the analogue section when no carrier is detected.

After demodulation, the FM-signals are subjected to a de-emphasis operation. After that the matrix of the stereo system is applied.

Audio processing
The sound processing in EM2E is completely done by the MSP3415D for 'Stereo' sets or the MSP3451G for 'Virtual Dolby' sets:

- Volume control is done by the user via the SOUND menu.
- Tone control in 'Stereo' sets is done via the BASS/TREBLE control, in 'Virtual Dolby' sets via the 5-band equaliser.
- Headphone control in 'Stereo'-sets is done via the loudspeaker output of the MSP, no sound control possible. In 'Virtual Dolby'-sets, the MSP has a separate Headphone output so separate sound control is possible.
- Mute control can be done in different ways:
  - Via the SOUND_ENABLE line of the OTC. Used during start-up/switch-off conditions, in order to avoid audible plops.
  - Via the decoding part of the MSP.
  - Via the processing part of the MSP.

The mute on the RC or in the UI is per today a combination of processing mute and SOUND_ENABLE line. When a user mute is done, the processing mute will turn down the volume, after which the SOUND_ENABLE line is switched. De-muting is the other way around. The reasons for this is a technical problem with crosstalk of the headphone into the loudspeakers.

Automatic Volume Levelling (AVL)
One of the features of the MSP-family is AVL. If used, it limits the big volume differences in the broadcast between e.g. news transmissions and commercials or within a movie.
To be able to get a Dolby approval (for the Virtual Dolby sets), the AVL feature must be switchable. Therefore, the AVL feature is customer switchable via the menu.

Audio amplification
The audio amplifier part is very straight forward. It uses an integrated power amplifier IC, the TDA2616. It delivers an

output of 2 x 10 WRMS to 2 full range speakers. A subwoofer is not implemented.

The supply voltage is +28 V, generated by the main supply via L5506.

Muting is done via the SOUND-ENABLE line connected to pin 2 of the amplifier-IC and coming from the OTC. This signal is inverted by TS7730, as a result of which at a high level of the SOUND-ENABLE signal, current is sinked from pin 2 and the IC mutes.

9.1.13 Teletext / NexTView (diagram B5)

Teletext

The TXT-decoder in the OTC gets its video signal directly on pin 5 (from the HIP).
The RGB-outputs are available on pins 77/78/79. Fast blanking is realised via pen 80.
In the previous chassis there was separate memory to store the TXT information. In EM2E the DRAM (IC7007) of the microprocessor is also used for the TXT-decoder.

NexTView

NexTView allows the user to display a program guide on the TV screen that contains extensive information for each program.

This information can be displayed in a number of different summaries:

- DAY: The daily summary shows, from the current moment, the program schedule for several stations for a short time ahead.
- CHANNEL: The channel summary shows the program schedule for one station.
- THEME: The theme summary shows, for each theme, the program schedule of the various stations. These themes consist of sport, film, culture, etc. and is determined from the station side.

NexTView does not have to restrict itself to information about the station that is being viewed, but also offers information about other stations. In the various summaries 3 different commands can be given for the various program overviews. These commands appear as follows:

- WATCH: The set immediately switches over to the station concerned.
- REMINDER: The start time and date and the station of the program concerned is stored in the TV reminder list. The TV will give an OSD-message with the program information, or switch on the set at the correct moment (provided the set is in Standby) and tune to the station concerned.
- RECORD: The timer of the video recorder with 'Easylink Plus' is programmed with the data of the program concerned. There has to be a video recorder (with Easylink Plus) connected to SCART2 otherwise the 'RECORD' function will not be highlighted. The connection is via pin 10 from SCART. This means that it has to be a full SCART or at least pin 10 has to be wired.

In order to be able to realise NexTView, two teletext type data flows, Data stream 1 and 2, are transmitted with various sub-code pages of information. This data flow can transport limited information (max. 40 pages). Data stream 1 is quick repeating with a repetition time of approximately 20 to 30 seconds. However, Data stream 2 has a much longer repetition time of approximately half an hour and has a large transport capacity.

- Data stream 1 contains information of the station that is being viewed.
- Data stream 2 contains up to one week of advance information from various stations that are covered by the provider.

9.1.14 CRT / SCAVEM / Rotation (diagram F)

RGB amplifiers

On the CRT panel, the RGB amplifier (TDA6108, IC7307) is located. Via the outputs 9, 8 and 7 the cathodes of the picture tube are driven.
The supply voltage for the amplifier is 180 V and is derived from the LOT.

SCAVEM

The SCAVEM-circuitry is implemented in the layout of the picture tube panel. It is thus not an extra module. SCAVEM means SCAn VElocity Modulation. This means that the horizontal deflection is influenced by the picture content. In an ideal square wave, the sides are limited in slope by a limited bandwidth (5 MHz).
SCAVEM will improve the slope as follows: At a positive slope, a SCAVEM-current is generated which supports the deflection current. The first half of the slope the spot is accelerated and the picture is darker, while at the second half of the slope, the spot is delayed and the slope becomes steeper.
At the end of the slope, the SCAVEM-current decays to zero and the spot is at the original position. An overshoot occurs which improves the impression of sharpness. At the negative slope, the SCAVEM-current counteracts the deflection.
During the first half of the slope, the spot is delayed, the slope becomes steeper.
During the second half the spot accelerates, the SCAVEM-current is zero at the end of the slope.

Via the three resistors R33315, R33317 and R3320, Red, Green and Blue are added together and offered to the emitter TS7300. On the collector of this transistor, configured in a common base, the sum of these 3 signals is obtained. Via the emitter follower formed with TS7301, this signal is conveyed to the differentiator C2303, R3309 and R3318. Only the high frequencies are differentiated (small RC-time).
The positive and negative pulses of this signal drive respectively TS7303 and TS7302 into conductivity. The DC setting of the output stage is set by R3304, R3308, R3316 and R3319. The working voltage of the transistors is settled at half the supply voltage.
At the positive section of the pulse, the current flows through R3318, C2307, the SCAVEM-coil and TS7303. At the negative section of the pulse, the current flows through R3318, C2409, the SCAVEM-coil and TS7302.

Rotation

In sets with a rotation coil (widescreen sets ≥ 32"), the amount of frame rotation is adjusted with the DAC-output of the HOP (see also 'Vertical Deflection').

9.1.15 Software related features

Following features are described:

- Smart Local Doming Prevention (SLDP)
- Auto TV
- Switch ON behaviour

Smart Local Doming Prevention (SLDP)

A CRT with an iron shadow mask shows a considerable amount of local doming (due to local heating), resulting in unwanted colour artefacts.
SLDP helps to reduce these artefacts for both 16:9 and 4:3 sets to an acceptable level. It measures the beam current in areas that are sensitive to local doming and reduces the contrast if the beam current in these places exceeds a pre-set threshold.
The chosen solution in EM2E, is based on the PICNIC hardware and software and it uses the histogram measurement of the PICNIC to make a prediction of the local heating of the CRT shadow mask.

With SLDP, local doming is diminished to an acceptable level at the cost of contrast reduction. By using a 'smart' solution for a part of the necessary contrast reduction, the resulting picture remains even more acceptable.
SLDP is not a feature. It's an algorithm that diminishes local doming effects. These effects occur whenever iron mask (and in a limited way invar mask) tubes are applied. Therefore, there is no reason to make it switchable for the customer. However, SLDP can be switched off via the Service Alignment Mode (SAM).

AutoTV

The AutoTV (or 'Automatic Picture Control' or 'Active Control') aims at giving the customer the best possible picture performance at any time. Therefor it does real time processing of the video signal and as a result, it decides to adapt several video parameters throughout the whole chassis.

The AutoTV feature integrates traditional picture performance, AutoTV functionality and 'smart controls' in order to come to a kind of 'supersmart' TV. It can be subdivided in:

- Auto Noise Reduction. This algorithm measures the amount of noise in the incoming video signal (this is done by the LIMERIC part of the PICNIC). As a result of this measurement, the amount of noise in the picture is corrected, starting from that noise level which is annoying for the customer. Which parameters exactly can be used is depending on the hardware.
- Auto Sharpness. This algorithm measures the amount of sharpness via the bandwidth of the incoming video signal and adapts the peaking frequency in the PICNIC according to this info. If the 'sharpness meter' sees the video content as 'sharp', high frequency peaking will be used. On the other hand, if the picture content is seen as 'not sharp', a low/mid frequency peaking is used. There is a coupling between the Auto Noise and the Auto Sharpness algorithm: if noise is present in the video content, then in general the sharpness will be made less aggressive. Special care has to be taken to the interaction of the LIMERIC and the vertical peaking of the PICNIC: a too big amount of vertical peaking increases the visibility of the 2DNR artefacts.

In the EM2E a limited AutoTV control function is used: only a combination of above described features is used in the background in order to improve the set performance, specially focussed on noise reduction.

Switch ON behaviour

First of all, the microprocessor needs to start up: After the power is applied, the 'Standby supply' starts oscillating, generating the +5V2 and +3V3. When ready, a reset (POR) is generated and the OTC is awakened.

During reset, the OTC puts a high level on all his outputs, causing the degaussing relay to close. After the reset, the outputs and inputs of the OTC must be initialised to their default state. The degaussing output of the OTC must stay high for 12 seconds.

Next step is the check whether the set needs to be in Standby or not. Therefore, the NVM content is read and the Standby-bit is checked. If the set is to stay in Standby, there is no further action.

If the set has to be switched 'on', the Standby-info line is pulled low. This results in the low power mode start-up of the HOP. The line drive starts to run on 50 kHz, wakes up the main supply and the +5 V, +8 V and +141 V supplies become available. The OTC waits until the +8 V is fully present. This is done by checking the ADC input of the OTC. A positive result means three times a positive +8 V detection in a row (time between each polling approx. 5 ms). If this detection still fails after 1 second, an error should be generated and the set must be switched to protection (error: "+8 V).

After detection of the +8 V, the MSP must be reset, since it can disturb I^2C traffic when not properly reset. From this moment on, I^2C traffic is possible.

To be sure that the HOP is properly started up, the POR bit of the HOP should be read. If this is not successful, the Standby info has to be put high again and an error code (code 11: HOP) will be generated. If the reading of the POR bit is successful, the starting procedure can be continued.

The Standby info line must be switched high again. The sync mode and the black current stabilisation loop of the HOP must be disabled in order to have a smooth start-up. Within 23.5 ms after reading the HOP POR bit, the HOP has to be started up via the HOP_start commando. If this condition is not fulfilled, the HOP will stop his line drive again and the set will not be able to start up.

During start-up of the deflection, I^2C traffic must be disabled for 250 ms to avoid data corruption. If flashes or spikes are generated during EHT start-up, I^2C data could be disturbed or corrupted.

After deflection is powered up completely, all protection algorithms are set active.
The rest of the NVM content can now be read and the IC's can be initialised according this info.

If SLDP is present in the set, an initialisation of SLDP has to be performed, including a calibration of the beamcurrent ADC.

The sync-mode of the HOP must be switched to active and the black current stabilisation loop in the HOP is switched on. Some extra checking is done to ensure that the loops are completely stabilised. Software sets all the necessary parameters for a correct sound and image and unblanks the picture.

A provision is foreseen to avoid sets in the field that will never unblank, if the picture tube is severely worn out. If the black current stabilisation does not become stable within a time frame of 30 seconds, the picture is unblanked anyway

9.2 Abbreviation list

AARA	Automatic Aspect Ratio Adaptation: algorithm that adapts aspect ratio to remove horizontal black bars; keeping up the original aspect ratio
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page
ADC	Analogue Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the featurebox
AI	Artificial Intelligence
AM	Amplitude Modulation
ANR	Automatic Noise Reduction: one of the algorithms of Auto TV
AR	Aspect Ratio: 4 by 3 or 16 by 9
Artistic	see OTC 2.5: main processor
ASF	Auto Screen Fit: algorithm that adapts aspect ratio to remove horizontal black bars but without throwing away video information
ATV	See Auto TV
AUDIO_C	Audio Centre
AUDIO_L	Audio Left
AUDIO_R	Audio Right
AUDIO_SL	Audio Surround Left
AUDIO_SW	Audio Subwoofer
AUDIO-L-PROC	Audio left processed
AUDIO-R-PROC	Audio right processed
AUDIO-SR	Audio surround right
Auto TV	Name for the combination of picture features/improvements which work automatically (ANR / Auto sharpness/ Auto Histo/ambient light).
BC-PROT	Beam current protection
BG	System B and G
BLC-INFO	Black current information
B-SC1-IN	Blue SCART1 in
B-SC2-IN	Blue SCART2 in
B-TXT	Blue teletext
CENTER	Centre speaker
C-FRONT	Chrominance front input
CL	Constant Level: audio output to connect with an external amplifier
ComPair	Computer aided rePair
CRT	Cathode Ray Tube or picture tube
CSM	Customer Service Mode
CTI	Colour Transient Improvement: manipulates steepness of chroma transients
CVBS	Composite Video Blanking and Synchronisation
CVBS-SC1-IN	CVBS SCART1 in
CVBS-SC2 OUT	CVBS SCART2 out
CVBS-SC2-IN	CVBS SCART2 in
CVBS-SC3-IN	CVBS SCART3 in
CVBS-SC4-IN	CVBS SCART4 IN
CVBS-TER	CVBS terrestrial
CVBS-TXT-DS-OUT	CBVBS teletext Dual Screen out
CVBS-TXT-OUT	CVBS teletext out
CVBS-Y-FRONT	CVBS luminance front input
DAC-HOP	Digital analogue converter HOP IC
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DC-filament	Filament supply voltage
DC-PROT	DC protection
DFU	Direction For Use: description for the end user
DNR	Digital Noise Reduction: noise reduction feature of the box
DSP	Digital Signal Processing
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode
DVD	Digital Versatile Disc
DYN-FASE-COR	Dynamic phase correction
EHT	Extra High Tension
EHT-INFO	Extra High Tension information
ELDP	Electrical Local Doming Prevention (only HW)
EPG	Electronic Program Guide: system used by broadcasters to transmit TV guide information (= NexTView)
EW	East West, related to horizontal deflection of the set
EXT	External (source), entering the set via SCART or via cinches
FBL	Fast Blanking: DC signal accompanying RGB signals
FBL-SC1-IN	Fast blanking signal for SCART1 in
FBL-SC2-IN	Fast blanking signal for SCART2 in
FBL-TXT	Fast Blanking Teletext
FBX	Feature Box: part of small signal / separate module which contains 100 Hz processing, extra featuring and AutoTV algorithms
FEAT-U	U from Feature Box
FEAT-V	V from Feature Box
FEAT-Y	Y from Feature Box
FILAMENT	Filament of CRT
FLASH	Flash memory
FM	Field Memory or Frequency Modulation
FMS	Functional Module Specification: document that describes an isolated hardware function
FRONT-C	Front input chrominance (SVHS)
FRONT-DETECT	Front input detection
FRONT-Y_CVBS	Front input luminance or CVBS (SVHS)
FRS	Functional Requirement Specification: software specification document
G-SC1-IN	Green SCART1 in
G-SC2-IN	Green SCART2 in
G-TXT	Green teletext
HA	Horizontal Acquisition: horizontal sync pulse coming out of the HIP
HD100	Horizontal Drive: horizontal sync pulse coming out of the featurebox
HDTV	High Definition TV: highest resolution defined by the ATSC standard (1080 lines and 1920 horizontal pixels, referred to as 1080i) The second HDTV standard, 720p x 1280 is not used in EM2E chassis (3fH standard not feasible)
Headroom	Extra margin provision to avoid clipping of signals
HEATER	Heater (Filament)
HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection
HFB+13V	Non rectified output 13V-winding LOT
HIP	High-end video Input Processor: video and chroma decoder of EM2E
HOP	High-end video Output Processor: video, sync and geometry controller of EM2E
HP	Headphone
HSI	Hardware Software Interface

IN-FRONT-SNDL	Sound left front in
IN-FRONT-SNDR	Sound right front in
IN-SC1-B	In SCART1 Blue
IN-SC1-G	In SCART1 Green
IN-SC1-R	In SCART1 Red
IN-SC1-SNDL	In SCART1 sound left
IN-SC1-SNDR	In SCART1 sound right
IN-SC2-B	In SCART2 Blue
IN-SC2-CVBS_Y	In SCART2 CVBS or luminance (SVHS)
IN-SC2-FBL	In SCART2 fast blanking
IN-SC2-G	In SCART2 Green
Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in "pairs", causing line flicker.
IO-BUS	In/Out - Bus
Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
LDP	Line Deflection Protection
LED	Light Emitting Diode
LINE-DRIVE	Line drive signal
LNA	Low Noise Adapter
LSP	Large signal panel
MSP	Multistandard Sound Processor: ITT sound decoder of EM2E
MUTE	Mute-Line
NC	Not Connected
NDF	No vertical DeFlection: vertical flyback protection
NHF	No Horizontal deflection: horizontal flyback protection
NVM	Non Volatile Memory: IC containing TV related data e.g. alignments
O/C	Open Circuit
ON/OFF LED	On/Off control signal for the LED
OSD	On Screen Display
OTC	On screen display Teletext and Control; also named Artistic (SAA5800)
P50	Project 50 communication: protocol between TV and peripherals
PCB	Printed Circuit board
PICNIC	Peripheral Integrated Combined Network IC: main IC for 100 Hz featuring and feature processing
PILOT	Pilot Signal
PILOTMUTE	Pilot Mute signal
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.
PTP	Picture Tube Panel
RAM	Random Access Memory
RC	Remote Control
RC5	RC5 signal from the remote control receiver
RESET	Reset signal
ROM	Read Only Memory
SAM	Service Alignment Mode
SC	Sandcastle: pulse derived from sync signals
SCAVEM	Scan Velocity Modulation
S/C	Short Circuit
SC1-OUT	SCART output of the MSP audio IC
SC2-B-IN	Scart2 Blue in
SC2-C-IN	Scart2 chrominance in
SC2-OUT	SCART output of the MSP audio IC
SIF	Sound Intermediate Frequency
SIMM	80-fold connector between LSP and SSB
SLDP	Smart Local Dooming Prevention (HW and SW)
SNDL-SC1-IN	Sound left SCART1 in
SNDL-SC1-OUT	Sound left SCART1 out
SNDL-SC2-IN	Sound left SCART2 in
SNDL-SC2-OUT	Sound left SCART2 out
SNDR-SC1-IN	Sound right SCART1 in
SNDR-SC1-OUT	Sound right SCART1 out
SNDR-SC2-IN	Sound right SCART2 out
SNDR-SC2-OUT	Sound right SCART2 out
SNDS-VL-OUT	Surround sound left variable level out
SNDS-VR-OUT	Surround sound right variable level out
SNERT	Synchronous No parity Eight bit Reception and Transmit
SSB	Small Signal Board
STBY	Standby
SW	Subwoofer
TXT	Teletext
TXT DS	Teletext Dual Screen
µP	microprocessor
VA	Vertical Acquisition
V_{BAT}	main supply for deflection (mostly 141 V)
VD100	Vertical Drive: vertical sync pulse from deflection
VFB	Vertical Flyback Pulse: vertical sync pulse coming from the feature box
VL	Variable Level out: processed audio output towards external amplifier
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XTAL	Quartz crystal
Y-OUT	Luminance-signal to HOP IC

10. Spare parts list

Large Signal Panel [A]

Various

0010	2422 025 16374	2P Male
0020	4822 267 10774	2P Male
0032	4822 492 70788	IC-SPRING
0037	3104 304 21112	LOT SSB SUPPORT
0045	4822 267 10734	5P MALE
0065	3104 304 22031	LOT SPACER
0066	3104 304 21591	SCART SUPPORT BRACKET
0150	4822 265 11253	FUSE HOLDER
0153	4822 265 11253	FUSE HOLDER
0317	4822 265 20723	2P MALE
0324	3104 311 01881	CABLE 7P 480mm
0325	2422 025 16382	3P Male
0735	2422 025 16407	3P Male
0736	2422 025 16382	3P Male
0936	2422 025 12485	11P Male
0940	4822 267 10968	11P FEMALE
0943	4822 267 10748	3P MALE
0945	4822 267 10735	3P MALE
0946	5322 268 90415	2P MALE
0947	4822 267 10734	5P MALE
1001	4822 252 60151	SURGE PROTECT
1002	2422 132 07411	RELAY 1P 5V 5A
1003	4822 267 10973	1P
1200	4822 210 10848	UV1316/A I U-2
1205	2422 025 16599	80P Female SIMM
1501	4822 070 34002	FUSE 4A
1503	2422 086 10912	FUSE 2,5A
1901	4822 267 10771	IC SOCKET 42P
1902	4822 267 10982	2P
8000	4822 320 12525	CABLE
8001	4822 320 20234	EHT CABLE
8015	4822 320 20216	CABLE
	3122 785 100	Supply Kit Mains Supply EM2E
	3122 785 100	Supply Kit Standby Supply EM2E
	3122 785 100	Line Repair Kit EM2E

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2101	5322 122 32818	2.2nF 10% 100V
2102	4822 124 40248	10µF 20% 63V
2103	5322 122 32531	100pF 5% 50V
2104	4822 123 14025	2200µF 20% 16V
2105	5322 122 32531	100pF 5% 50V
2106	5322 126 10223	4.7nF 10% 63V
2107	5322 122 32818	2.2nF 10% 100V
2108	4822 121 70162	10nF 5% 400V
2109	4822 126 13482	470nF 80/20% 16V
2110	5322 121 42498	680nF 5% 63V
2111	4822 121 43526	47nF 5% 250V
2113	4822 122 33127	2.2nF 10% 63V
2114	4822 126 10206	2.2nF 10% 500V
2200	4822 124 40196	220µF 20% 16V
2201	4822 126 14076	220nF 25V
2202	4822 126 13473	220nF 80-20% 50V
2203	4822 124 41584	100µF 20% 10V
2400	4822 124 11575	47µF 20% 160V
2412	4822 126 13751	47nF 10% 63V
2413	4822 124 12255	10µF 20% 50V
2414	4822 126 13751	47nF 10% 63V
2415	4822 122 33575	220pF 5% 63V
2417	4822 126 14076	220nF 25V
2419	4822 126 14237	470pF 10% 2KV
2420	4822 121 70594	1nF 5% 2KV
2421	2022 333 00086	470nF 5% 250V
2421	4822 121 42634	560nF 5% 250V
2425	4822 121 10526	9N1 5% 2KV
2425	4822 121 70435	10nF 5% 2KV
2426	4822 121 10653	22nF 5% 630V
2426	4822 121 10658	24nF 5% 630V
2429	4822 121 43343	4.7nF 10% 400V
2430	4822 121 41857	10nF 5% 250V
2431	4822 121 42077	6.8nF 10% 400V
2431	4822 126 13599	3.3nF 10% 500V
2433	2022 333 00086	470nF 5% 250V
2433	4822 121 42634	560nF 5% 250V
2435	4822 121 10526	9N1 5% 2KV
2450	5322 121 42578	100nF 5% 250V
2455	5322 126 10511	1nF 5% 50V
2460	4822 124 40784	3300µF 20% 16V
2461	4822 122 31177	470pF 10% 500V
2462	4822 124 80061	1000µF 20% 25V
2463	4822 122 31177	470pF 10% 500V
2464	4822 124 80061	1000µF 20% 25V
2465	4822 122 31177	470pF 10% 500V
2468	4822 124 12297	4.7µF 20% 350V
2469	4822 122 31177	470pF 10% 500V
2480	4822 121 51442	2.2nF 10% 50V
2489	4822 124 40433	47µF 20% 25V
2490	4822 122 33891	3.3nF 10% 63V
2491	4822 124 40768	0.47µF 20% 100V
2492	4822 126 14076	220nF 25V
2495	4822 126 13838	100nF 20% 50V
2499	4822 126 13838	100nF 20% 50V
2501	4822 126 11524	1.5nF 10% 1KV
2502	5322 122 32818	2.2nF 10% 100V
2503	5322 121 42489	33nF 5% 250V
2505	4822 126 14504	3.3nF 20% 250V
2507	4822 126 13589	470nF 275V
2508	4822 126 14153	2.2nF 10%B 1KV
2509	4822 126 14153	2.2nF 10%B 1KV
2510	4822 124 12415	220µF 20% 400V
2512	4822 124 12056	1000µF 20% 35V
2513	5322 122 34099	470pF 10% 63V
2514	5322 122 31863	63V 330pF 5%
2515	4822 124 11575	47µF 20% 160V
2518	4822 126 11308	47pF 5% 500V
2519	5322 122 32818	2.2nF 10% 100V
2520	4822 126 14585	100nF 10% 50V
2521	4822 122 33216	270pF 5% 50V
2528	4822 126 14585	100nF 10% 50V
2530	4822 126 14585	100nF 10% 50V
2531	4822 122 31169	1.5nF 10% 500V
2535	4822 121 43913	470nF 10% 100V
2536	4822 126 10206	2.2nF 10% 500V
2537	4822 124 11913	22nF 20% 275V
2538	5322 126 10223	4.7nF 10% 63V
2600	4822 121 43913	470nF 10% 100V
2601	4822 121 51252	470nF 5% 63V
2602	4822 124 40433	47µF 20% 25V
2603	4822 122 33177	10nF 20% 50V
2604	4822 124 40248	10µF 20% 63V
2610	4822 122 33127	2.2nF 10% 63V
2620	4822 126 14076	220nF 25V
2621	4822 126 13838	100nF 20% 50V
2622	4822 124 40255	100µF 20% 63V
2624	4822 121 51252	470nF 5% 63V
2625	4822 121 51252	470nF 5% 63V
2627	5322 124 40641	10µF 20% 100V
2642	4822 124 40255	100µF 20% 63V
2700	4822 124 21913	1µF 20% 63V
2701	4822 124 21913	1µF 20% 63V
2730	4822 124 81151	22µF 50V
2731	4822 124 81151	22µF 50V
2732	4822 124 40255	100µF 20% 63V
2733	4822 124 40255	100µF 20% 63V
2734	4822 124 81151	22µF 50V
2735	4822 124 81151	22µF 50V
2736	5322 122 31865	1.5nF 10% 63V
2737	5322 122 31865	1.5nF 10% 63V
2756	4822 126 13751	47nF 10% 63V
2760	4822 124 80061	1000µF 20% 25V
2761	4822 124 80061	1000µF 20% 25V
2765	4822 124 40255	100µF 20% 63V
2767	4822 124 40255	100µF 20% 63V
2782	4822 126 13751	47nF 10% 63V
2902	5322 122 31863	330pF 5% 63V
2903	5322 122 31863	330pF 5% 63V
2906	5322 122 32531	100pF 5% 50V
2909	5322 122 31863	330pF 5% 63V
2910	5322 122 32531	100pF 5% 50V
2912	4822 124 40248	10µF 20% 63V
2913	4822 126 14585	100nF 10% 50V
2915	5322 122 31863	330pF 5% 63V
2916	5322 122 31863	330pF 5% 63V
2917	5322 122 32531	100pF 5% 50V
2919	5322 122 31863	330pF 5% 63V
2920	5322 122 32531	100pF 5% 50V
2923	5322 122 31863	330pF 5% 63V
2925	5322 122 31863	330pF 5% 63V
2926	4822 124 81044	470µF 20% 6.3V
2927	4822 124 40433	47µF 20% 25V
2941	5322 122 31865	1.5nF 10% 63V
2942	5322 122 31865	1.5nF 10% 63V
2951	4822 124 21913	1µF 20% 63V
2952	4822 126 13751	47nF 10% 63V
2953	4822 126 13751	47nF 10% 63V

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3101	4822 053 20106	10M 5% 0.25W
3102	4822 050 26801	680Ω 1% 0.6W
3103	4822 050 26801	680Ω 1% 0.6W
3104	4822 116 52195	47Ω 5% 0.5W
3105	4822 050 26801	680Ω 1% 0.6W
3106	4822 116 52256	2k2 5% 0.5W
3107	4822 116 52256	2k2 5% 0.5W
3108	4822 116 52182	15Ω 5% 0.5W
3110	4822 052 10109	10Ω 5% 0.33W
3113	4822 116 52182	15Ω 5% 0.5W
3114	4822 116 83872	220Ω 5% 0.5W
3117	4822 116 52195	47Ω 5% 0.5W
3118	4822 050 24708	4Ω7 1% 0.6W
3120	4822 051 20109	10Ω 5% 0.1W
3123	4822 116 52176	10Ω 5% 0.5W
3124	4822 116 52199	68Ω 5% 0.5W
3125	4822 116 52182	15Ω 5% 0.5W
3126	4822 050 21003	10k 1% 0.6W
3127	4822 116 52289	5k6 5% 0.5W
3200	4822 051 20101	100Ω 5% 0.1W
3201	4822 051 20101	100Ω 5% 0.1W
3250	4822 051 20223	22k 5% 0.1W
3402	4822 117 10837	100k 1% 0.1W
3403	4822 051 20101	100Ω 5% 0.1W
3404	4822 051 20471	470Ω 5% 0.1W
3406	4822 051 20101	100Ω 5% 0.1W
3407	4822 117 10833	10k 1% 0.1W
3410	4822 051 20479	47Ω 5% 0.1W
3411	4822 116 52193	39Ω 5% 0.5W
3414	4822 117 13577	330Ω 1% 1.25W
3415	3198 012 31590	15Ω 5% 3W
3415	4822 117 12836	12Ω 5% 3W
3417	4822 116 52176	10Ω 5% 0.5W
3418	4822 050 22704	270k 1% 0.6W
3431	4822 052 10101	100Ω 5% 0.33W
3431	4822 052 10221	220Ω 5% 0.33W
3450	4822 116 52303	8k2 5% 0.5W
3450	4822 116 83961	6k8 5%
3451	4822 116 52257	22k 5% 0.5W
3460	4822 052 10108	1Ω 5% 0.33W
3461	4822 052 10108	1Ω 5% 0.33W
3462	4822 052 10108	1Ω 5% 0.33W
3463	4822 052 10108	1Ω 5% 0.33W
3464	4822 052 10108	1Ω 5% 0.33W
3465	4822 052 10108	1Ω 5% 0.33W
3466	4822 052 10688	6Ω8 5% 0.33W
3466	4822 052 10828	8Ω2 5% 0.33W
3467	4822 052 10108	1Ω 5% 0.33W
3468	4822 052 11688	6Ω8 5% 0.5W
3475	4822 116 52175	100Ω 5% 0.5W
3481	4822 116 52175	100Ω 5% 0.5W
3483	4822 051 10102	1k 2% 0.25W
3484	4822 117 11139	1k5 1% 0.1W
3485	4822 117 11454	820Ω 1% 0.1W
3486	4822 117 12955	2k7 1% 0.1W
3487	4822 117 11449	2k2 1% 0.1W
3488	4822 116 52272	330k 5% 0.5W
3488	4822 116 83874	220k 5% 0.5W
3489	4822 117 11449	2k2 1% 0.1W
3491	4822 050 21504	150k 1% 0.6W
3495	4822 051 20683	68k 5% 0.1W
3496	4822 117 11507	6k8 1% 0.1W
3497	4822 117 10834	47k 1% 0.1W
3498	4822 051 20472	4k7 5% 0.1W
3499	4822 117 10837	100k 1% 0.1W
3500	4822 117 12074	1Ω5 10% 7W
3501	3198 013 04710	470Ω 2% 1/2W
3504	4822 116 83883	470Ω 5% 0.5W
3507	4822 050 21604	160k 1% 0.6W
3508	3198 012 16820	6.8k 1W
3509	2322 595 90021	VDR DC 1M A/495V
3510	4822 117 11951	2k 1% 0.1W
3511	4822 116 52276	3k9 5% 0.5W
3512	4822 116 52297	68k 5% 0.5W
3513	4822 116 52272	330k 5% 0.5W
3514	4822 053 10108	1Ω 5% 1W
3515	4822 053 10108	1Ω 5% 1W
3516	4822 116 10075	9Ω 220V
3518	4822 050 11204	120k 1% 0.4W
3519	4822 051 20223	22k 5% 0.1W
3520	4822 053 11333	33k 5% 2W

3521	4822 117 10118	1M 5% 0.5W
3522	4822 116 83961	6k8 5%
3523	4822 051 20105	1M 5% 0.1W
3524	4822 051 10102	1k 2% 0.25W
3525	4822 051 20479	47Ω 5% 0.1W
3526	4822 116 83303	1Ω 2W
3527	4822 117 11454	820Ω 1% 0.1W
3528	4822 117 10833	10k 1% 0.1W
3529	4822 051 20472	4k7 5% 0.1W
3530	4822 116 52297	68k 5% 0.5W
3531	4822 117 10833	10k 1% 0.1W
3533	4822 051 20159	15Ω 5% 0.1W
3535	4822 051 20273	27k 5% 0.1W
3536	4822 117 10837	100k 1% 0.1W
3537	4822 117 10833	10k 1% 0.1W
3538	4822 051 20332	3k3 5% 0.1W
3539	4822 117 10833	10k 1% 0.1W
3540	4822 117 10834	47k 1% 0.1W
3541	4822 117 10833	10k 1% 0.1W
3542	3198 012 11570	0Ω15 5% 1W
3543	4822 051 20478	4Ω7 5% 0.1W
3544	4822 051 20479	47Ω 5% 0.1W
3600	4822 050 22205	2M2 1% 0.6W
3601	4822 050 22205	2M2 1% 0.6W
3602	4822 051 20332	3k3 5% 0.1W
3603	4822 101 11319	100Ω LIN
3605	4822 051 20273	27k 5% 0.1W
3606	4822 051 10102	1k 2% 0.25W
3607	4822 051 20223	22k 5% 0.1W
3608	4822 051 20223	22k 5% 0.1W
3609	4822 101 11193	47k 30% LIN 0.1W
3610	4822 051 20683	68k 5% 0.1W
3611	4822 051 20822	8k2 5% 0.1W
3612	4822 051 20274	270k 5% 0.1W
3613	4822 051 20274	270k 5% 0.1W
3614	4822 050 21005	1M 1% 0.6W
3615	4822 050 18204	820k 1% 0.4W
3615	4822 116 52292	560k 5% 0.5W
3616	4822 116 52285	470k 5% 0.5W
3617	4822 050 11002	1k 1% 0.4W
3618	4822 051 10102	1k 2% 0.25W
3619	4822 051 20562	5k6 5% 0.1W
3620	4822 116 80176	1Ω 5% 0.5W
3620	4822 116 80676	1Ω5 5% 0.5W
3621	4822 116 80176	1Ω 5% 0.5W
3622	4822 116 80176	1Ω 5% 0.5W
3623	4822 117 10834	47k 1% 0.1W
3624	4822 052 10158	1Ω5 5% 0.33W
3625	4822 116 83872	220Ω 5% 0.5W
3626	4822 116 83872	220Ω 5% 0.5W
3627	4822 050 21003	10k 1% 0.6W
3630	4822 051 10102	1k 2% 0.25W
3631	4822 051 20332	3k3 5% 0.1W
3632	4822 117 10833	10k 1% 0.1W
3633	4822 050 21003	10k 1% 0.6W
3644	4822 117 10833	10k 1% 0.1W
3645	4822 116 52245	150k 5% 0.5W
3652	4822 051 20101	100Ω 5% 0.1W
3701	4822 117 10833	10k 1% 0.1W
3702	4822 117 10833	10k 1% 0.1W
3730	4822 117 10833	10k 1% 0.1W
3731	4822 117 10833	10k 1% 0.1W
3732	4822 051 20822	8k2 5% 0.1W
3733	4822 051 20822	8k2 5% 0.1W
3734	4822 117 10834	47k 1% 0.1W
3735	4822 117 10834	47k 1% 0.1W
3736	4822 051 10102	1k 2% 0.25W
3737	4822 051 10102	1k 2% 0.25W
3738	4822 117 11148	56k 1% 0.1W
3739	4822 117 11148	56k 1% 0.1W
3740	4822 051 20683	68k 5% 0.1W
3741	4822 051 20683	68k 5% 0.1W
3742	4822 116 52199	68Ω 5% 0.5W
3743	4822 116 52199	68Ω 5% 0.5W
3756	4822 117 10833	10k 1% 0.1W
3762	4822 051 20828	8Ω2 5% 0.1W
3765	4822 117 11507	6k8 1% 0.1W
3770	4822 117 10834	47k 1% 0.1W
3771	4822 116 83933	15k 1% 0.1W
3773	4822 116 83933	15k 1% 0.1W
3789	4822 051 20828	8Ω2 5% 0.1W
3790	4822 051 10102	1k 2% 0.25W
3792	4822 051 10102	1k 2% 0.25W
3900	4822 116 83868	150Ω 5% 0.5W
3901	4822 117 10353	150Ω 1% 0.1W
3902	4822 117 10353	150Ω 1% 0.1W
3903	4822 117 10353	150Ω 1% 0.1W
3905	4822 116 83883	470Ω 5% 0.5W
3906	4822 116 52201	75Ω 5% 0.5W
3907	4822 051 20561	560Ω 5% 0.1W
3908	4822 116 52201	75Ω 5% 0.5W
3909	4822 116 52201	75Ω 5% 0.5W
3910	4822 116 52201	75Ω 5% 0.5W
3911	4822 116 52201	75Ω 5% 0.5W
3913	4822 116 52201	75Ω 5% 0.5W
3915	4822 116 52201	75Ω 5% 0.5W
3916	4822 051 20822	8k2 5% 0.1W
3918	4822 051 20392	3k9 5% 0.1W
3919	4822 051 10102	1k 2% 0.25W
3920	4822 051 10102	1k 2% 0.25W
3921	4822 117 10353	150Ω 1% 0.1W
3922	4822 117 10353	150Ω 1% 0.1W
3923	4822 117 10353	150Ω 1% 0.1W
3924	4822 117 10353	150Ω 1% 0.1W
3925	4822 052 10688	6Ω8 5% 0.33W
3928	4822 051 20101	100Ω 5% 0.1W
3929	4822 117 10833	10k 1% 0.1W
3930	4822 051 20561	560Ω 5% 0.1W
3932	4822 116 52201	75Ω 5% 0.5W
3935	4822 116 52201	75Ω 5% 0.5W
3936	4822 117 10353	150Ω 1% 0.1W
3937	4822 117 10353	150Ω 1% 0.1W
3940	4822 117 10353	150Ω 1% 0.1W
3941	4822 117 10353	150Ω 1% 0.1W
3942	4822 051 20822	8k2 5% 0.1W
3944	4822 051 10102	1k 2% 0.25W
3945	4822 051 20392	3k9 5% 0.1W
3946	4822 051 10102	1k 2% 0.25W
3970	4822 051 20471	470Ω 5% 0.1W
3971	4822 117 10833	10k 1% 0.1W
3972	4822 117 10833	10k 1% 0.1W
3991	4822 116 52175	100Ω 5% 0.5W
3992	4822 051 20101	100Ω 5% 0.1W
3993	4822 051 20101	100Ω 5% 0.1W
3994	4822 116 52175	100Ω 5% 0.5W
3995	4822 116 52175	100Ω 5% 0.5W
3996	4822 116 52175	100Ω 5% 0.5W
3997	4822 116 52175	100Ω 5% 0.5W
3998	4822 116 52175	100Ω 5% 0.5W
4xxx	4822 051 10008	0Ω 5% 0.25W
4xxx	4822 051 20008	0Ω 5% 0.25W
9220	4822 051 20008	JUMPER
9225	4822 051 20008	JUMPER
9723	4822 051 20008	JUMPER
9724	4822 051 20008	JUMPER

5101	4822 146 11065	STANDBY TFM
5102	4822 157 70436	8.2µH
5103	4822 526 10704	BEAD 50MHz
5104	4822 157 11411	BEAD 100MHz
5105	4822 526 10704	BEAD 100MHz
5200	4822 157 11775	6.8µH 5%
5400	4822 157 11869	33µH 10%
5410	4822 146 11065	TFM SIG FIX
5411	4822 157 71097	0.56µH
5421	4822 157 11204	COIL LINE CORR.(29")
5421	4822 157 11839	COIL LINE CORR. (28")
5421	4822 157 11841	COIL LINE CORR. (28"WS,32"WS)
5422	4822 157 71535	COIL BRIDGE
5424	4822 157 63255	COIL BRIDGE
5430	8204 000 73321	LOT (29")
5430	8228 001 33243	LOT (25",28")
5461	4822 157 11411	BEAD 100MHz
5463	4822 157 11411	BEAD 100MHz
5465	4822 157 11411	BEAD 100MHz
5466	4822 157 71467	39U 10%
5467	4822 157 11411	BEAD 100MHz
5504	2422 549 43286	MAINS 35mH 1A5
5505	4822 157 11411	BEAD 100MHz
5506	2422 531 98042	TFM W8085-002 Y
5510	4822 157 11411	BEAD 100MHz
5620	4822 157 11771	0.09µH 10%

6103	4822 130 42488	BYD33D
6105	4822 130 34281	BZX79-B15
6106	4822 130 34499	BZX79-B20
6108	4822 130 30621	1N4148
6109	4822 130 31083	BYW55
6111	4822 130 32715	SB340
6120	4822 130 30621	1N4148
6121	4822 130 30621	1N4148
6122	3198 010 53980	BZX79-B3V9
6200	9322 149 10685	BZM55-C33
6201	4822 130 83757	BAS216
6202	4822 130 83757	BAS216
6203	4822 130 10852	BZX284-C6V8
6204	4822 130 10852	BZX284-C6V8
6205	4822 130 83757	BAS216
6405	4822 130 11027	BZX284-C33
6406	4822 130 83757	BAS216
6407	4822 130 83757	BAS216
6408	4822 130 42488	BYD33D
6421	4822 130 10753	BY359X-1500
6422	4822 130 10218	BY229X-800
6442	9322 129 42685	BZM55-C15
6461	4822 130 82512	BYV29F-400
6462	4822 130 41487	BYV95C
6464	5322 130 31938	BYV27-200
6468	4822 130 42488	BYD33D
6480	4822 130 42488	BYD33D
6481	4822 130 31024	BZX79-B18
6482	4822 130 83757	BAS216
6499	4822 130 83757	BAS216
6501	4822 130 31083	BYW55
6502	4822 130 31083	BYW55
6503	4822 130 31083	BYW55
6504	4822 130 31083	BYW55
6505	4822 130 34281	BZX79-B15
6506	4822 130 30621	1N4148
6507	4822 130 80791	BYV28-200/20
6508	4822 130 11415	BYV28-400/20
6510	4822 130 34281	BZX79-B15
6511	4822 130 83757	BAS216
6512	4822 130 83757	BAS216
6514	5322 130 31932	BZT03-C200
6515	4822 130 32904	BZV85-C5V6
6516	4822 130 83757	BAS216
6517	4822 130 31983	BAT85
6518	4822 130 83757	BAS216
6520	4822 130 42488	BYD33D
6521	4822 130 83757	BAS216
6522	4822 130 83757	BAS216
6600	4822 130 31983	BAT85
6616	4822 130 83757	BAS216
6619	4822 130 42488	BYD33D
6620	5322 130 31938	BYV27-200
6621	4822 130 42488	BYD33D
6622	5322 130 33635	BZV85-C8V2
6623	4822 130 83757	BAS216

7100	4822 130 44568	BC557B
7101	4822 130 40959	BC547B
7102	4822 130 11417	STP3NB60FP
7104	4822 130 11418	TCDT1102G
7407	4822 130 60511	BC847B
7408	9332 592 40126	BC368
7409	4822 130 60511	BC847B
7421	4822 130 63666	BU2520DF
7480	4822 130 11417	STP3NB60FP
7481	4822 130 44568	BC557B
7482	4822 130 11418	TCDT1102G
7499	4822 130 60373	BC856B
7502	4822 130 61675	BF487
7504	9322 126 65687	STP5NB60FP
7505	4822 130 60373	BC856B
7506	4822 209 81397	TL431CLPST
7510	4822 130 60511	BC847B
7511	4822 130 60373	BC856B
7528	4822 130 40981	BC337-25
7529	4822 130 60511	BC847B
7600	4822 130 44461	BC546B
7602	4822 130 60511	BC847B
7603	4822 130 60373	BC856B
7605	4822 130 60511	BC847B
7606	4822 130 60511	BC847B
7610	4822 130 11418	TCDT1102G
7620	4822 209 90009	TDA8177
7641	4822 130 60511	BC847B
7652	4822 130 60511	BC847B
7720	4822 130 60511	BC847B
7721	4822 130 60511	BC847B
7722	4822 130 60373	BC856B
7723	4822 130 60373	BC856B
7724	4822 130 60511	BC847B
7725	4822 130 60511	BC847B
7730	4822 130 60511	BC847B
7750	4822 209 32269	TDA2616/N1
7900	4822 130 40959	BC547B
7901	4822 130 40959	BC547B
7905	9332 592 40126	BC368
7906	4822 209 12334	L4940V85
7907	4822 130 60511	BC847B

Small Signal Panel [B]

Various

1001	2422 543 89022	RES XTL 6M000
1301	2422 540 98456	RES 12MHz
1305	2422 543 01092	RES XTL 4M433619
1308	2422 543 01097	RES XTL 3M579545
1405	2422 549 44369	FIL SAW 38MHz
1407	2422 549 44324	FIL TPWCC04BS
1408	2422 549 44372	FIL SAW 38MHz
1409	2422 025 16542	2P MALE
1651	2422 543 89019	RES XTL 8M432
1701	2422 543 89018	RES XTL 12MHz

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2001	4822 126 11671	33pF
2002	4822 126 11669	27pF
2003	4822 126 13879	220nF 20% 16V
2004	4822 126 13879	220nF 20% 16V
2005	4822 126 14305	100nF 10% 16V
2006	4822 126 14305	100nF 10% 16V
2007	4822 126 14305	100nF 10% 16V
2008	4822 126 14305	100nF 10% 16V
2009	4822 122 33777	47pF 5% 63V
2010	4822 122 33777	47pF 5% 63V
2011	4822 122 33777	47pF 5% 63V
2012	4822 122 33777	47pF 5% 63V
2013	4822 124 12095	100µF 20% 16V
2014	4822 126 14305	100nF 10% 16V
2015	4822 126 14305	100nF 10% 16V
2016	4822 124 12095	100µF 20% 16V
2017	4822 126 14305	100nF 10% 16V
2019	4822 126 14305	100nF 10% 16V
2020	4822 126 13883	220pF 5% 50V
2022	4822 126 14305	100nF 10% 16V
2023	4822 126 14305	100nF 10% 16V
2024	4822 126 14305	100nF 10% 16V
2025	4822 126 14305	100nF 10% 16V
2026	4822 126 14305	100nF 10% 16V
2027	4822 126 14305	100nF 10% 16V
2028	4822 126 14305	100nF 10% 16V
2029	4822 126 14305	100nF 10% 16V
2031	4822 126 14305	100nF 10% 16V
2032	4822 126 14305	100nF 10% 16V
2033	4822 126 14226	82pF 5% 50V
2034	4822 126 14226	82pF 5% 50V
2035	4822 126 14226	82pF 5% 50V
2036	4822 126 14226	82pF 5% 50V
2037	4822 126 14226	82pF 5% 50V
2038	4822 126 14305	100nF 10% 16V
2300	4822 124 12095	100µF 20% 16V
2303	5322 126 11583	10nF 10% 50V
2304	4822 122 33741	10pF 10% 50V
2306	4822 126 13881	470pF 5% 50V
2307	4822 126 14305	100nF 10% 16V
2308	4822 122 33741	10pF 10% 50V
2313	4822 121 70159	0.1µF 16V
2314	4822 124 12095	100µF 20% 16V
2315	4822 126 14305	100nF 10% 16V
2317	4822 126 14491	2.2µF 10V
2318	4822 126 14494	22nF 10% 25V
2319	5322 126 11583	10nF 10% 50V
2320	4822 122 33741	10pF 10% 50V
2321	4822 126 14305	100nF 10% 16V
2322	4822 126 14305	100nF 10% 16V
2323	4822 126 14305	100nF 10% 16V
2324	5322 126 11583	10nF 10% 50V
2325	4822 126 14305	100nF 10% 16V
2328	4822 122 33761	22pF 5% 50V
2329	4822 126 14305	100nF 10% 16V
2330	4822 126 14305	100nF 10% 16V
2331	4822 126 14305	100nF 10% 16V
2332	4822 126 14305	100nF 10% 16V
2333	4822 126 14491	2.2µF 10V
2334	4822 126 14491	2.2µF 10V
2335	4822 124 80349	47µF 20% 6.3V
2336	4822 126 14491	2.2µF 10V
2338	5322 126 11583	10nF 10% 50V
2340	4822 124 23002	10µF 16V
2341	4822 124 12095	100µF 20% 16V
2350	4822 126 14305	100nF 10% 16V
2351	4822 126 14305	100nF 10% 16V
2352	4822 126 14305	100nF 10% 16V
2356	4822 126 14305	100nF 10% 16V
2357	4822 126 14305	100nF 10% 16V
2358	5322 126 11579	3.3nF 10% 63V
2359	4822 122 33752	15pF 5% 50V
2361	3198 016 31580	1P5 50V
2362	4822 126 11663	12pF
2365	4822 126 14305	100nF 10% 16V
2366	4822 126 14305	100nF 10% 16V
2367	4822 126 14305	100nF 10% 16V
2368	4822 126 14305	100nF 10% 16V
2369	4822 126 14305	100nF 10% 16V
2370	4822 126 14305	100nF 10% 16V
2371	4822 126 13193	4.7nF 10% 63V
2372	4822 126 14043	1µF 20% 16V
2373	4822 126 14305	100nF 10% 16V
2374	4822 126 14491	2.2µF 10V
2375	4822 126 14494	22nF 10% 25V
2376	4822 126 14305	100nF 10% 16V
2377	4822 124 12095	100µF 20% 16V
2378	4822 126 14305	100nF 10% 16V
2384	4822 126 14305	100nF 10% 16V
2406	4822 126 13883	220pF 5% 50V
2407	4822 126 13956	68pF 5% 63V
2408	3198 016 32780	2P7 50V
2409	4822 126 14491	2.2µF 10V
2410	4822 126 14472	1µF 10% 10V
2411	4822 126 14305	100nF 10% 16V
2412	4822 126 13193	4.7nF 10% 63V
2413	4822 124 80151	47µF 16V
2417	3198 017 44740	470nF 10V
2418	4822 126 13956	68pF 5% 63V
2420	4822 122 33753	150pF 5% 50V
2501	4822 122 33777	47pF 5% 63V
2502	4822 122 32927	220nF 20% 50V
2503	4822 122 32927	220nF 20% 50V
2504	4822 122 32927	220nF 20% 50V
2505	4822 122 32927	220nF 20% 50V
2508	4822 124 12095	100µF 20% 16V
2546	4822 124 23002	10µF 16V
2547	4822 124 23002	10µF 16V
2548	4822 124 23002	10µF 16V
2549	4822 124 23002	10µF 16V
2550	4822 126 14241	330P 50V
2551	5322 126 11579	3.3nF 10% 63V
2609	3198 016 31020	0603 25V 1nF
2610	4822 126 14238	2N2 50V
2611	5322 126 11578	1nF 10% 50V
2629	4822 122 32927	220nF 20% 50V
2636	4822 122 32927	220nF 20% 50V
2637	4822 122 32927	220nF 20% 50V
2638	4822 122 32927	220nF 20% 50V
2640	4822 126 13879	220nF 20% 16V
2641	4822 122 32927	220nF 20% 50V
2642	4822 122 32927	220nF 20% 50V
2651	4822 126 14305	100nF 10% 16V
2652	4822 122 33777	47pF 5% 63V
2653	4822 122 32927	220nF 20% 50V
2654	4822 126 13881	470pF 5% 50V
2655	4822 126 13881	470pF 5% 50V
2656	4822 126 13881	470pF 5% 50V
2657	4822 126 13881	470pF 5% 50V
2658	4822 126 13881	470pF 5% 50V
2661	4822 122 32927	220nF 20% 50V
2662	4822 122 32927	220nF 20% 50V
2663	4822 126 13881	470pF 5% 50V
2664	4822 126 13881	470pF 5% 50V
2665	4822 124 12095	100µF 20% 16V
2666	4822 124 12095	100µF 20% 16V
2667	3198 016 33380	3P3 50V
2668	3198 016 33380	3P3 50V
2669	4822 124 23002	10µF 16V
2670	5322 126 11583	10nF 10% 50V
2673	3198 016 31020	1nF 25V
2674	3198 016 31020	1nF 25V
2675	4822 124 23002	10µF 16V
2677	3198 030 82280	2U2 20% 50V
2677	4822 124 23002	10µF 16V
2678	4822 124 23002	10µF 16V
2679	4822 126 14305	100nF 10% 16V
2680	4822 124 23002	10µF 16V
2681	4822 126 14305	100nF 10% 16V
2682	4822 124 23002	10µF 16V
2685	3198 016 31020	1nF 25V
2686	3198 016 31020	1nF 25V
2690	4822 126 14305	100nF 10% 16V
2691	4822 126 14305	100nF 10% 16V
2692	4822 126 14305	100nF 10% 16V
2693	4822 126 13883	220pF 5% 50V
2702	4822 124 23002	10µF 16V
2703	4822 126 14305	100nF 10% 16V
2704	4822 124 23002	10µF 16V
2706	4822 124 12095	100µF 20% 16V
2707	4822 126 14305	100nF 10% 16V
2708	4822 124 23002	10µF 16V
2709	4822 126 14305	100nF 10% 16V
2710	4822 124 23002	10µF 16V
2712	4822 124 23002	10µF 16V
2713	4822 126 14305	100nF 10% 16V
2717	4822 126 14218	3.9pF 50V
2718	4822 126 11669	27pF
2719	4822 126 11663	12pF
2720	4822 126 14218	3.9pF 50V
2721	4822 126 11669	27pF
2723	4822 126 11663	12pF
2724	4822 126 14218	3.9pF 50V
2725	4822 126 11669	27pF
2726	4822 126 11663	12pF
2728	4822 126 14305	100nF 10% 16V
2729	4822 126 14225	56pF 5% 50V
2730	4822 126 14494	22nF 10% 25V
2731	4822 122 31765	100pF 2% 63V
2733	4822 126 14494	22nF 10% 25V
2738	4822 126 14494	22nF 10% 25V
2743	4822 126 14494	22nF 10% 25V
2747	4822 126 14507	18pF 5% 50V
2748	4822 126 14507	18pF 5% 50V
2755	4822 126 14305	100nF 10% 16V
2756	4822 126 14305	100nF 10% 16V
2757	4822 124 23002	10µF 16V
2758	4822 126 14305	100nF 10% 16V
2759	4822 126 14305	100nF 10% 16V
2760	4822 126 14305	100nF 10% 16V
2761	4822 126 14305	100nF 10% 16V
2762	4822 126 14305	100nF 10% 16V
2763	4822 126 14305	100nF 10% 16V
2764	4822 126 14305	100nF 10% 16V
2765	4822 126 14305	100nF 10% 16V
2766	4822 126 14305	100nF 10% 16V
2767	4822 126 14305	100nF 10% 16V
2770	4822 126 14305	100nF 10% 16V
2771	4822 126 14305	100nF 10% 16V
2772	4822 126 14305	100nF 10% 16V
2773	4822 126 14305	100nF 10% 16V
2774	4822 126 14305	100nF 10% 16V
2776	4822 126 14305	100nF 10% 16V
2785	4822 126 14305	100nF 10% 16V
2786	4822 126 14305	100nF 10% 16V
2788	4822 126 14305	100nF 10% 16V
2790	4822 126 14305	100nF 10% 16V
2792	4822 126 14305	100nF 10% 16V
2795	4822 126 14305	100nF 10% 16V
2796	4822 126 14305	100nF 10% 16V
2797	4822 126 13956	68pF 5% 63V
2798	3198 016 36810	680P 25V
2902	5322 126 11583	10nF 10% 50V

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3001	4822 051 30472	4k7 5% 0.062W
3002	4822 051 30472	4k7 5% 0.062W
3003	4822 051 30223	22k 5% 0.062W
3006	4822 051 30471	470Ω 5% 0.062W
3007	4822 117 13521	470Ω 5% 0.63W
3008	4822 117 13526	150Ω 5% 0.63W
3009	4822 051 30689	68Ω 5% 0.063W
3011	4822 051 30471	470Ω 5% 0.062W
3012	4822 051 30471	470Ω 5% 0.062W
3013	4822 051 30103	10k 5% 0.062W
3014	4822 051 30682	6k8 5% 0.062W
3015	4822 051 30474	470k 5% 0.062W
3016	4822 051 30152	1k5 5% 0.062W
3017	4822 051 30472	4k7 5% 0.062W
3018	4822 051 30103	10k 5% 0.062W
3019	4822 051 30472	4k7 5% 0.062W
3020	4822 051 30103	10k 5% 0.062W
3021	4822 051 30103	10k 5% 0.062W
3023	4822 051 30471	470Ω 5% 0.062W
3024	4822 051 30273	27k 5% 0.062W
3025	4822 051 30221	220Ω 5% 0.062W
3026	4822 051 30103	10k 5% 0.062W
3027	4822 117 12925	47k 1% 0.063W
3028	4822 051 30471	470Ω 5% 0.062W
3029	4822 051 30103	10k 5% 0.062W
3030	4822 051 30103	10k 5% 0.062W
3031	4822 051 30103	10k 5% 0.062W
3032	4822 051 30471	470Ω 5% 0.062W
3033	4822 051 30103	10k 5% 0.062W
3034	4822 051 30101	100Ω 5% 0.062W
3035	4822 117 13522	100Ω 5% 0.63W
3039	4822 051 30101	100Ω 5% 0.062W
3040	4822 051 30103	10k 5% 0.062W
3041	4822 051 30562	5k6 5% 0.063W
3044	2120 108 92846	4k7 5%
3058	4822 051 30682	6k8 5% 0.062W

3059	2322 704 66201	620Ω 1%
3060	4822 051 30103	10k 5% 0.062W
3061	4822 051 30103	10k 5% 0.062W
3062	4822 051 30103	10k 5% 0.062W
3064	4822 117 13522	100Ω 5% 0.63W
3073	4822 051 30471	470Ω 5% 0.062W
3074	4822 051 30471	470Ω 5% 0.062W
3075	4822 051 30103	10k 5% 0.062W
3076	4822 051 30471	470Ω 5% 0.062W
3077	4822 051 30272	2k7 5% 0.062W
3078	4822 051 30471	470Ω 5% 0.062W
3079	4822 051 30471	470Ω 5% 0.062W
3080	4822 051 30103	10k 5% 0.062W
3081	4822 051 30471	470Ω 5% 0.062W
3083	4822 051 30471	470Ω 5% 0.062W
3084	4822 051 30103	10k 5% 0.062W
3085	4822 051 30471	470Ω 5% 0.062W
3086	4822 051 30471	470Ω 5% 0.062W
3087	4822 051 30471	470Ω 5% 0.062W
3088	4822 051 30471	470Ω 5% 0.062W
3090	4822 051 30471	470Ω 5% 0.062W
3091	4822 051 30471	470Ω 5% 0.062W
3092	4822 051 30221	220Ω 5% 0.062W
3300	2322 750 63908	3Ω9 5%
3304	2322 750 63908	3Ω9 5%
3306	4822 051 30221	220Ω 5% 0.062W
3307	4822 051 30183	18k 5% 0.062W
3308	4822 051 30684	680k 5% 0.062W
3310	4822 117 12925	47k 1% 0.063W
3311	4822 117 13632	100k 1% 0.62W
3314	4822 051 30103	10k 5% 0.062W
3315	4822 051 30102	1k 5% 0.062W
3316	4822 051 30123	12k 5% 0.062W
3317	4822 051 30221	220Ω 5% 0.062W
3318	4822 051 30102	1k 5% 0.062W
3320	4822 051 30101	100Ω 5% 0.062W
3321	4822 051 30101	100Ω 5% 0.062W
3322	4822 051 10102	1k 2% 0.25W
3324	4822 051 30222	2k2 5% 0.062W
3327	4822 117 13632	100k 1% 0.62W
3328	4822 051 30393	39k 5% 0.062W
3329	4822 117 13568	6Ω8 5%
3330	4822 051 30332	3k3 5% 0.062W
3331	4822 051 30102	1k 5% 0.062W
3333	4822 051 30102	1k 5% 0.062W
3334	4822 051 30102	1k 5% 0.062W
3335	4822 051 30332	3k3 5% 0.062W
3336	4822 051 30102	1k 5% 0.062W
3337	4822 117 12903	1k8 1% 0.063W
3338	4822 051 30682	6k8 5% 0.062W
3340	4822 051 30101	100Ω 5% 0.062W
3341	4822 051 30101	100Ω 5% 0.062W
3342	4822 051 30101	100Ω 5% 0.062W
3343	4822 051 30683	68k 5% 0.062W
3344	4822 051 30222	2k2 5% 0.062W
3345	4822 051 30103	10k 5% 0.062W
3346	4822 051 30333	33k 5% 0.062W
3347	4822 051 30223	22k 5% 0.062W
3348	4822 051 30222	2k2 5% 0.062W
3362	4822 051 30103	10k 5% 0.062W
3363	4822 051 30102	1k 5% 0.062W
3364	4822 051 30683	68k 5% 0.062W
3365	4822 051 30472	4k7 5% 0.062W
3366	4822 051 30102	1k 5% 0.062W
3367	4822 051 30102	1k 5% 0.062W
3370	4822 051 30101	100Ω 5% 0.062W
3371	4822 051 30479	47Ω 5% 0.062W
3372	4822 051 30471	470Ω 5% 0.062W
3376	4822 051 30101	100Ω 5% 0.062W
3377	4822 051 30101	100Ω 5% 0.062W
3378	4822 051 30153	15k 5% 0.062W
3382	4822 051 30471	470Ω 5% 0.062W
3384	4822 051 30101	100Ω 5% 0.062W
3385	4822 051 30471	470Ω 5% 0.062W
3386	4822 051 30223	22k 5% 0.062W
3388	4822 051 30102	1k 5% 0.062W
3389	4822 117 12925	47k 1% 0.063W
3390	4822 051 30153	15k 5% 0.062W
3391	4822 051 30683	68k 5% 0.062W
3393	4822 117 13632	100k 1% 0.62W
3394	4822 051 30472	4k7 5% 0.062W
3400	4822 117 11152	4Ω7 5%
3406	4822 051 30479	47Ω 5% 0.062W
3411	4822 051 30472	4k7 5% 0.062W
3414	4822 051 30472	4k7 5% 0.062W
3415	4822 117 12902	8k2 1% 0.063W
3416	4822 117 13568	6Ω8 5%
3418	4822 051 30391	390Ω 5% 0.062W
3419	4822 051 30759	75Ω 5% 0.062W
3435	4822 051 30472	4k7 5% 0.062W
3436	4822 051 30221	220Ω 5% 0.062W
3437	4822 051 30102	1k 5% 0.062W
3439	4822 051 30471	470Ω 5% 0.062W
3441	4822 051 30393	39k 5% 0.062W
3445	4822 051 30471	470Ω 5% 0.062W
3446	4822 051 30101	100Ω 5% 0.062W
3532	4822 051 30102	1k 5% 0.062W
3533	4822 051 30103	10k 5% 0.062W
3540	4822 051 30103	10k 5% 0.062W
3550	4822 051 30102	1k 5% 0.062W
3551	4822 051 30102	1k 5% 0.062W
3552	4822 051 30472	4k7 5% 0.062W
3610	4822 117 12925	47k 1% 0.063W
3611	4822 117 12925	47k 1% 0.063W
3612	4822 117 12925	47k 1% 0.063W
3613	4822 117 12925	47k 1% 0.063W
3614	4822 117 12925	47k 1% 0.063W
3615	4822 117 12925	47k 1% 0.063W
3616	4822 051 30682	6k8 5% 0.062W
3617	4822 051 30682	6k8 5% 0.062W
3621	4822 051 30105	1M 5% 0.062W
3636	4822 051 30105	1M 5% 0.062W
3637	4822 051 30105	1M 5% 0.062W
3638	4822 051 30105	1M 5% 0.062W
3642	4822 051 30105	1M 5% 0.062W
3644	4822 051 30105	1M 5% 0.062W
3653	3198 021 90030	JUMPER
3654	3198 021 90030	JUMPER
3655	4822 051 30101	100Ω 5% 0.062W
3656	4822 051 30101	100Ω 5% 0.062W
3657	4822 051 30334	330k 5% 0.062W
3658	4822 051 30334	330k 5% 0.062W
3659	4822 051 30334	330k 5% 0.062W
3660	4822 051 30334	330k 5% 0.062W
3661	4822 117 11817	1k2 1% 1/16W
3662	4822 117 11817	1k2 1% 1/16W
3663	4822 117 11817	1k2 1% 1/16W
3665	4822 051 30272	2k7 5% 0.062W
3673	4822 051 30472	4k7 5% 0.062W
3676	4822 117 11817	1k2 1% 1/16W
3677	4822 051 30334	330k 5% 0.062W
3678	4822 117 11817	1k2 1% 1/16W
3679	4822 051 30334	330k 5% 0.062W
3680	4822 117 11817	1k2 1% 1/16W
3683	4822 051 30272	2k7 5% 0.062W
3684	3198 021 90030	JUMPER
3685	3198 021 90030	JUMPER
3688	3198 021 90030	JUMPER
3689	3198 021 90030	JUMPER
3702	4822 117 12139	22Ω 5% 0.062W
3703	4822 051 30101	100Ω 5% 0.062W
3705	4822 051 30101	100Ω 5% 0.062W
3706	4822 051 30109	10Ω 5% 0.062W
3707	4822 051 30392	3k9 5% 0.063W
3708	4822 051 30272	2k7 5% 0.062W
3709	3198 021 90030	JUMPER
3710	4822 051 30391	390Ω 5% 0.062W
3711	4822 051 30102	1k 5% 0.062W
3712	4822 051 30391	390Ω 5% 0.062W
3713	4822 051 30391	390Ω 5% 0.062W
3714	4822 117 12139	22Ω 5% 0.062W
3716	4822 051 30472	4k7 5% 0.062W
3717	4822 051 30472	4k7 5% 0.062W
3718	4822 051 30221	220Ω 5% 0.062W
3719	4822 117 13574	1Ω5 5% 1206
3720	4822 117 13574	1Ω5 5% 1206
3721	4822 117 13572	22Ω 5% 1206
3722	4822 117 13572	22Ω 5% 1206
3725	4822 051 30105	1M 5% 0.062W
3728	4822 051 30101	100Ω 5% 0.062W
3731	4822 051 30101	100Ω 5% 0.062W
3732	4822 051 10102	1k 2% 0.25W
3733	4822 051 30101	100Ω 5% 0.062W
3739	4822 051 30101	100Ω 5% 0.062W
3740	3198 021 90030	JUMPER
3741	4822 051 30102	1k 5% 0.062W
3744	4822 051 30102	1k 5% 0.062W
3745	4822 051 30102	1k 5% 0.062W
3746	4822 051 30472	4k7 5% 0.062W
3747	4822 051 30689	68Ω 5%
3748	4822 051 30689	68Ω 5%
3749	4822 051 30689	68Ω 5% 0.063W
3754	4822 051 30109	10Ω 5% 0.062W
3755	3198 021 90030	JUMPER
3757	3198 021 90030	JUMPER
3759	3198 021 90030	JUMPER
3790	4822 117 13522	100Ω 5% 0.63W
3791	4822 117 13522	100Ω 5% 0.63W
3792	4822 117 13522	100Ω 5% 0.63W
3793	4822 117 12662	10Ω 5%
3793	4822 117 13522	100Ω 5% 0.63W
3794	4822 117 12662	10Ω 5%
3794	4822 117 13522	100Ω 5% 0.63W
3795	4822 117 12662	10Ω 5%
3795	4822 117 13522	100Ω 5% 0.63W
3796	4822 051 30101	100Ω 5% 0.062W
3796	4822 051 30109	10Ω 5% 0.062W
3797	4822 051 30101	100Ω 5% 0.062W
3900	4822 051 30221	220Ω 5% 0.062W
3901	4822 051 30221	220Ω 5% 0.062W
3903	4822 051 30221	220Ω 5% 0.062W
3905	4822 051 30221	220Ω 5% 0.062W
3906	4822 051 30101	100Ω 5% 0.062W
3907	4822 051 30221	220Ω 5% 0.062W
3909	4822 051 30221	220Ω 5% 0.062W
3910	4822 051 30221	220Ω 5% 0.062W
3911	4822 051 30101	100Ω 5% 0.062W

5301	4822 157 11876	6.8µH 10%
5302	4822 157 11876	6.8µH 10%
5403	2422 549 44461	IND VAR 40mH
5404	2422 535 95427	100mH
5405	2422 535 95427	IND FXD 100mHz 120R
5406	3198 018 33980	3U9 10%
5407	3198 018 56880	6U8 10%
5408	2422 549 44459	IND VAR 78mH
5409	3198 018 51080	1U 10%
5410	3198 018 33370	0U33 10%
5651	2422 549 43769	100mH
5652	2422 549 43769	100mH
5653	2422 549 43769	100mH
5654	4822 157 11716	BLM21P300SPT
5701	4822 157 71206	BLM21A601SPT
5702	2422 535 95427	100mH
5703	4822 157 11716	BLM21P300SPT
5704	4822 157 11716	BLM21P300SPT
5705	2422 535 95427	100mH
5706	4822 157 11778	5U6 10%
5707	4822 157 11781	BLM11A601SPT1
5708	4822 157 11778	5U6 10%
5709	4822 157 11778	5U6 10%
5710	4822 157 11778	5U6 10%
5711	4822 157 11781	BLM11A601SPT1
5713	4822 157 11781	BLM11A601SPT1
5718	3198 018 33370	0U33 10%
5720	4822 157 11781	BLM11A601SPT1
5910	4822 157 11781	BLM11A601SPT1

6001	4822 130 11528	1PS76SB10
6003	4822 130 11528	1PS76SB10
6303	4822 130 11594	BZX284-C47
6304	4822 130 83757	BAS216
6306	9322 129 37685	BZM55-C5V6
6307	4822 130 11528	1PS76SB10
6309	4822 130 83757	BAS216
6310	9322 129 38685	BZM55-C6V8
6311	9322 149 08685	BZM55-C22
6319	4822 130 83757	BAS216
6334	4822 130 83757	BAS216
6403	4822 130 10414	BA792
6652	9322 129 40685	BZM55-C10
6653	4822 130 83757	BAS216

7001	9352 629 88557	SAA5801/011 V30
7002	5322 130 42756	BC857C
7003	3198 010 42310	BC847BW
7004	3198 010 42310	BC847BW
7005	9322 116 74668	LD1117D33
7006	3104 317 42211	SOFTW.ASSY 310431702211
7007	9322 136 53668	MSM51V18165D-60JS
7008	3198 010 42310	BC847BW
7009	3198 010 42310	BC847BW
7010	5322 130 42756	BC857C
7011	4822 209 17377	M24C32-WMN6/PROG
7301	9352 625 23518	TDA9330H/N2
7303	5322 130 42756	BC857C
7308	9340 310 30215	PDTC144ET
7309	9340 310 30215	PDTC144ET
7310	9340 310 30215	PDTC144ET
7311	3198 010 42310	BC847BW
7312	3198 010 42310	BC847BW
7320	3198 010 42310	BC847BW
7322	3198 010 42310	BC847BW
7323	9352 625 24518	TDA9321H/N2

7324	5322 130 63679	BC847CW
7403	4822 130 60511	BC847B
7407	4822 130 60373	BC856B
7411	4822 130 60511	BC847B
7651	9322 143 53671	MSP3415D-FH-B3
7651	9322 149 63671	MSP3451G-FH-A1
7652	9351 874 90118	74HC4052PW
7656	9340 425 20115	BC847BS
7658	9340 425 20115	BC847BS
7663	9340 425 20115	BC847BS
7674	3198 010 42310	BC847BW
7675	9351 874 90118	74HC4052PW
7680	3198 010 42310	BC847BW
7681	3198 010 42310	BC847BW
7701	5322 130 42756	BC857C
7702	3198 010 42310	BC847BW
7704	4822 209 73852	PMBT2369
7708	4822 209 90034	SAA4990H/V0
7709	9352 640 20557	SAA4978H/V203
7713	9322 116 74668	LD1117D33
7714	4822 209 17307	MSM54V12222A-30JS
7715	4822 209 17307	MSM54V12222A-30JS
7716	2422 486 80737	IC SOCKET 32P
	3104 311 42341	IC SOFTWARE

Main Switch Panel [E]

Various

0151	4822 256 91766	LED HOLDER
0201	2422 025 16268	2P MALE
0202	2422 025 16374	2P MALE
0923	2412 020 00724	2P MALE
0947	4822 267 10734	5P MALE
1910	4822 130 91478	IR RECEIVER
1951	4822 276 14024	2P 4/128A

2930	4822 124 41584	100µF 20% 10V

3957	4822 053 21335	3M3 5% 0.5W
3966	4822 053 21335	3M3 5% 0.5W
3978	4822 051 20101	100Ω 5% 0.1W
3982	4822 117 13577	330Ω 1% 1.25W

6901	4822 130 10859	TLDR5400

CRT Panel [F]

Various

0298	2422 500 80052	9P FEMALE
0340	3104 311 02321	CABLE 11P 400mm
0383	2422 025 16382	3P MALE

2300	4822 124 40764	22µF 100 V
2301	4822 124 40196	220µF 20% 16V
2302	5322 122 32286	3.3pF 5% 50V
2303	5322 122 32268	470pF 10% 50V
2304	4822 121 41856	22nF 5% 250V
2305	4822 124 41751	47µF 20% 50V
2306	4822 126 14585	100nF 10% 50V
2307	5322 122 32654	22nF 10% 63V
2308	4822 126 13486	15pF 2% 63V
2309	5322 122 32654	22nF 10% 63V
2310	4822 126 13689	18pF 1% 63V
2312	5322 122 32658	22pF 5% 50V
2313	4822 124 11565	10µF 20% 250V
2316	4822 121 40518	100nF 10% 250V
2317	5322 121 44356	4.7nF 5% 2KV
2318	5322 122 32654	22nF 10% 63V
2320	4822 126 13838	100nF 20% 50V
2321	5322 122 32531	100pF 5% 50V
2322	5322 122 32531	100pF 5% 50V
2323	5322 122 32531	100pF 5% 50V
2325	4822 126 14585	100nF 10% 50V

3300	4822 052 10109	10Ω 5% 0.33W
3301	4822 053 12103	10k 5% 3W
3302	4822 051 20182	1k8 5% 0.1W
3303	4822 117 10965	18k 1% 0.1W
3304	4822 117 11454	820Ω 1% 0.1W
3305	4822 117 13577	330Ω 1% 1.25W
3306	4822 051 20478	4Ω7 5% 0.1W
3307	4822 051 20109	10Ω 5% 0.1W
3308	4822 117 11148	56k 1% 0.1W
3309	4822 117 10353	150Ω 1% 0.1W
3310	4822 051 10102	1k 2% 0.25W
3311	4822 051 20101	100Ω 5% 0.1W
3312	4822 117 11449	2k2 1% 0.1W
3313	4822 116 83872	220Ω 5% 0.5W
3314	4822 116 83872	220Ω 5% 0.5W
3315	4822 117 11139	1k5 1% 0.1W
3316	4822 117 11148	56k 1% 0.1W
3317	4822 051 20122	1k2 5% 0.1W
3318	4822 051 20159	15Ω 5% 0.1W
3319	4822 117 11454	820Ω 1% 0.1W
3320	4822 051 10102	1k 2% 0.25W
3334	4822 050 11002	1k 1% 0.4W
3335	4822 051 10102	1k 2% 0.25W
3336	4822 051 10102	1k 2% 0.25W
3337	4822 051 10102	1k 2% 0.25W
3338	3198 013 01020	1k 2% 1/2W
3339	3198 013 01020	1k 2% 1/2W
3340	3198 013 01020	1k 2% 1/2W
3341	4822 052 10151	150Ω 5% 0.33W
3342	4822 051 20471	470Ω 5% 0.1W
3344	4822 116 52191	33Ω 5% 0.5W
3345	4822 116 52191	33Ω 5% 0.5W
3347	3198 013 01520	1k5 2% 1/2W
3348	4822 050 11204	120k 1% 0.4W
3349	3198 013 01020	1k 2% 1/2W
3350	4822 116 83883	470Ω 5% 0.5W
3351	4822 116 83883	470Ω 5% 0.5W
3352	4822 116 83883	470Ω 5% 0.5W
3354	4822 117 11449	2k2 1% 0.1W
3355	4822 051 20478	4Ω7 5% 0.1W
3356	4822 051 10102	1k 2% 0.25W
3357	4822 051 20478	4Ω7 5% 0.1W
4xxx	4822 051 10008	0Ω 5% 0.25W
4xxx	4822 051 20008	0Ω 5% 0.25W

5300	2422 531 98035	TFM S13974-01 Y

6305	4822 130 30842	BAV21
6306	4822 130 30842	BAV21
6307	4822 130 30842	BAV21
6310	4822 130 83757	BAS216

7300	4822 130 44154	BF199
7301	4822 130 42589	BF370
7302	5322 130 41888	BD140-16
7303	5322 130 41886	BD139-16
7307	9352 561 40112	TDA6108
8317	3104 311 01901	CABLE 2P 560mm
8325	3104 311 01911	CABLE 3P 680mm

Side I/O Panel [O]

Various

0900	2422 026 04926	4P FEMALE
0901	4822 267 10975	3P
0902	4822 267 31014	HEADPHONE SOCKET
0936	2422 025 12485	11P MALE

2905	4822 122 33177	10nF 20% 50V
2906	4822 122 33177	10nF 20% 50V

3901	4822 051 20101	100Ω 5% 0.1W
3902	4822 116 52201	75Ω 5% 0.5W
3903	4822 051 20101	100Ω 5% 0.1W
3904	4822 116 52201	75Ω 5% 0.5W
3905	4822 050 11002	1k 1% 0.4W
3906	4822 050 11002	1k 1% 0.4W
3907	4822 117 10834	47k 1% 0.1W
3908	4822 050 11002	1k 1% 0.4W
3909	4822 117 10834	47k 1% 0.1W
3910	4822 116 52276	3k9 5% 0.5W
3911	4822 050 21003	10k 1% 0.6W
3912	4822 050 21003	10k 1% 0.6W

Top Control Panel [P]

Various

0345	4822 267 10748	3P MALE
1701	4822 276 13775	SWITCH
1702	4822 276 13775	SWITCH
1703	4822 276 13775	SWITCH
1704	4822 276 13775	SWITCH
1705	4822 276 13775	SWITCH

3701	4822 051 20391	390Ω 5% 0.1W
3702	4822 117 13528	200Ω 1% 0.125W
3703	4822 117 10845	620Ω 1% 0.1W
3704	4822 117 11534	1k1 1% 0.1W
3705	4822 117 11951	2k 1% 0.1W
3999	4822 051 10102	1k 2% 0.25W